



ANATOMICAL  
EXERCITATIO-  
NS

W. HARVEY.

1653











27836/B/2

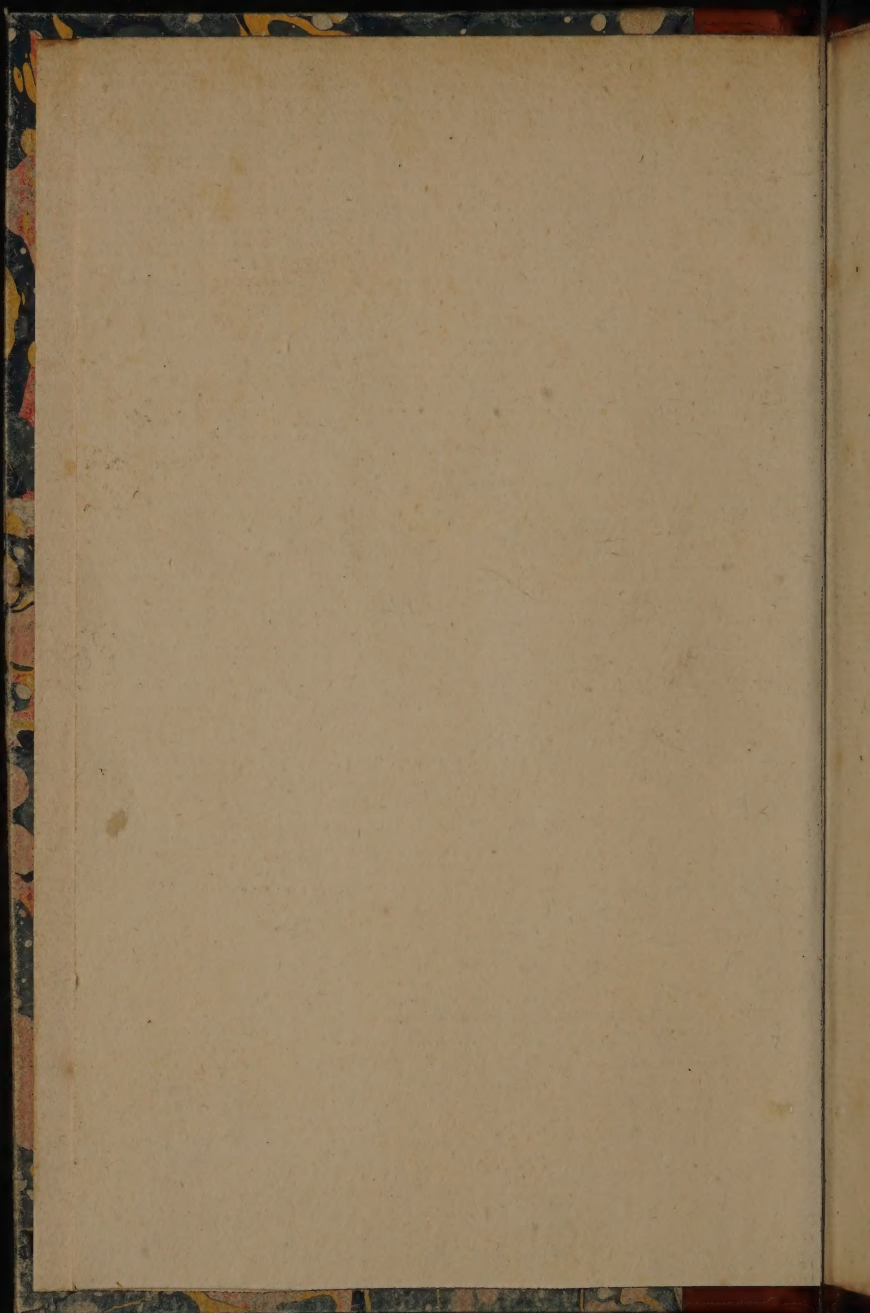
Harvey Coll.

Keynes 43

Last (blank) leaf wanting  
Port mounted on 1st blank  
leaf



mg  
ink  
4





G. Courthop.  
Dec: 24: 1725.

---

Walter Hawkins.  
May 1: 1850.

---

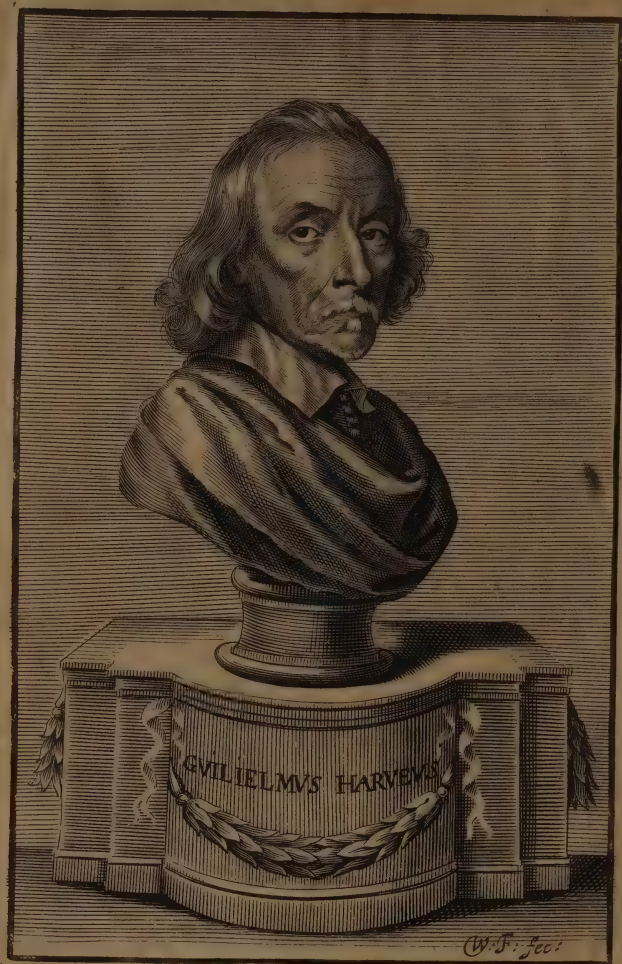
Geo. St. J. 1822

---

J. P. Smith



Page 131 Twine Eggs  
See a Specimen in  
Minter's Report 2 Nov - 0  
Specimen 25 -



A  
EX

G

To wh

By W

of

Printed

Publ

# ANATOMICAL EXERCITATIONS,

Concerning the  
GENERATION  
Of Living Creatures :

To which are added Particular Discourses,  
of *Births*, and of *Conceptions*, &c.

By WILLIAM HARVEY, Doctor  
of *Physick*, and Professor of *Anatomy*,  
and *Chirurgery*, in the COLLEGE  
of Physicians of LONDON.

---



---

LONDON,

Printed by James Young, for Octavian  
Pulleyn, and are to be sold at his Shop at the  
Sign of the Rose in St. Pauls Church-  
yard. 1653.





TO THE  
Venerable, & highly Accomplish't,  
THE  
PRESIDENT & FELLOWS  
of the COLLEDGE of Physitians  
in LONDON,

GEORGE ENT

*Wisheth Health and full Felicity.*

¶ Bout Christmas last, while,  
¶ A full weary of anxious, and  
¶ in the end not much availing Solicitude, I endeavour'd to  
render my mind serene, and free from  
that Eclipse; I address'd my self to  
that Eminent Person, the chiefest  
Glory and Ornament of our Colledge,  
Doctor Harvey, at that time residing  
not far from the City: and  
found Him very intent upon the per-  
scrutation of Natures Works, and with  
a Countenance as cheerful, as Mind  
imperturbed, Democritus like, deep-

## The Epistle Dedicatory.

ly searching into the Causes of natural things. I then instantly saluted Him, with, Are all Affaires well, and right?

How can they, He gravely answered, when the Common-wealth is surrounded with intestine troubles; and I my self as yet far from land, tost in that tempestuous Ocean? And, unfeignedly (added He) if the comfort of my Studies, and the remembrance of many things, long since fallen under my observation, were not some refreshment to my Mind; I know not what could prevaile upon me, to desire to survive the present. So it hath happened, that this umbratile kind of life, and vacation from publique Cares, which commonly causeth a Sadness of Mind in others, hath proved a Sovereign Remedy to mine.

Here I answering, said, Sir, I shall soon afford you the Reason of that happy Event; which is this; While  
the



## The Epistle Dedicatory.

the greatest number of men flatter themselves with thoughts of growing wise, by the notions of others Brains, and (without any addition, unless the deceitful Gloss of different Phrase, and new Method) with ostentation obtrude upon the World the Traditions of the Ancients; it hath been always your choice, about the secrets of Nature, to consult Nature Her selfe. And this kind of Study ever hath as less of Fallacy, so more of Delight: in regard, that frequently, while you are fixt upon the indagation of some one thing, many others offer themselves to your observation; and such, perhaps, of which you had no thought to enquire. For, your self (I well remember) was pleas'd once to tell me, that you never yet Dissected any Animal (and, indeed, you have dissected very many) but you found in it somewhat beyond your expectation, and which you never so much as thought of before. A 3 'Tis

## The Epistle Dedicatory.

'Tis true, replied He ; it hath ever been the delight of my Genius, to make strict Inspection into Animals themselves : And I have constantly been of opinion, that from thence we might acquire not only the knowledge of those less considerable Secrets of Nature ; but even a certain Adumbration of that Supreme Essence, the Creator. And, though I was ever ready to acknowledge ; that many things have been discovered by Learned Men of former times : Yet do I still believe, that the number of those things which remain yet concealed in the darkness of Impervestigable Nature, is incomparably greater ; nay, I cannot forbear frequently to wonder, and sometimes smile at those, who perswade themselves, that all things were so consummately and absolutely delivered by Aristotle, Galen, or some other great Name, as that nothing was left to the superaddition of  
any,

## The Epistle Dedicatory.

any, that succeeded. Nature, truly, is Her self the most faithful Interpreter of Her own secrets: and what she exhibits, either more briefly, or more obscurely, in one kind, the same she explains more largely and openly, in another. No man doubtless, hath ever rightly determined of the Use, or Office of any Part; who hath not in many Animals, beheld, and with himself diligently considered the Fabrick, Situation, annexed Vessels, and other Accidents thereof. Those Ancient Oracles of Wisdom did terminate the knowledge, as of all Countries; so also of all Animals, Plants, and other things whatever, almost with the narrow limits of Greece alone: But, to Us the whole Theatre of the World is now open, and, by the Sedulity of Travellers, we well know, not only the Place, Habits, and Manners of its Inhabitants; but also, what



## The Epistle Dedicatory.

what Animals, what Vegetables, what Minerals every Region is furnished withal. Nor is there any Nation so Barbarous, which hath not either by chance, or the constraint of some inevitable necessity, found out something for the common use and benefit of Mankind, which hath escaped the invention of other Nations more Civilized. And shal we think that nothing of Commodity can accrue to the stock of Sciences, from these Helps and Advantages: but that all the Fountains of Wisdom were drawn dry by the First Ages? Certainly, this Fault is to be imputed to our own defect of Industry; not at all to Nature.

To this, another Evil hath adjoined it self; which is, that many, wanting the Experimental cognition of things, from the formerly conceived verisimilitude of some Opinion, afterwards boldly broach a positive judge-

## The Epistle Dedicatory.

judgment thereupon, as if it were certainly known: whereupon it follows, that they are not only grossly deluded themselves, but seduce others also (who are not sufficiently circumspect) into Error.

These, and other Discourses of the like importance, flowing from the Doctor, with admirable readiness, as is customary with Him; I interrupted Him, saying: Sir, How free you are from all culpability in this kind, all, who know you, sufficiently understand: and that's the reason, why many Learned and Judicious Men, who are acquainted with your Unwearied Industry, in the advancement of Philosophy, greedily expect the Communication of your further Experiments.

And would you then advise me; (Smilingly replies the Doctor) to quit the tranquillity of this Haven, wherein I now calmly spend my days: and again

## The Epistle Dedicatory.

10

again commit my self to the unfaithful Ocean? You are not ignorant, how great troubles my *Lucubrations*, formerly published, have raised. Better it is, certainly, at some times, to endeavour to grow wise at home in private; then by the hasty divulgation of such things, to the knowledge whereof you have attained with vast labour, to stirr up Tempests, that may deprive you of your Leasure and Quiet for the future.

Yea but (answered I) to deserve well, and receive ill, is the usuall reward of Virtue: And the Winds, which raised those your troubles; have, like the Wind *Cæcias*, drawn mischief upon themselves. With that, He shewed me His Exercitations, touching the Generation of Animals, A work framed, and polished with very great pains. At sight whereof, I instantly rejoicing, said, I now have obtained what I earnestly



## The Epistle Dedicatory.

earnestly desired : and must tell you, that, unless you impart these Exercitations to the World, you will both be wanting to your own Honour, and en-  
vy the Utility of others. Nor shall you sustain any further trouble in the Business ; for, whatever of Care is requisite to the oversight of the Press, I shall willingly take wholly upon my self. To this He condescended with much adoe, at first urging, among many other Disswasive Arguments, that this His Tractate would be imperfect, without the conjunction of the History of the Generation of Insects. In a word ; at length I prevailed : and He said, Loe, I resign these my Writings freely into your hands, with absolute power, either suddainly to publish, or for a while to suppress them, as you shall think convenient. Having returned Him very many thanks for so high a favour ; I took my leave, and departed

12  
The Epistle Dedicatory.

ted as another Jason, enriched with the Golden Fleece. And when, upon my return home, I had surveyed the Book; I could not but admire that so vast a Treasure had lain so long concealed: And that, while other men arrogate so highly to themselves, onely for the entertainment of their nauseating Readers, with Trifles and Toies, and Dishes twice (yea, an hundred times) brought to the Table before; the Modesty of this Gentleman should be such, as to set so small a value upon these His Excellent Observations. And truly, when ever He hath been pleased to give any of his own Inventions leave to see the light, He hath not departed Himself with Ostentation, or superciliousness, after the custome of many, as if an Oak had spoken, or he had deserved a draught of Hens-Milk: but, His Dictates were Oraculons, and Merits above the reach of

## The Epistle Dedicatory.

of Elogie, or Reward: but, with exceeding Modesty, as if onely casually, or without any difficultie of inquest, he had fallen upon the Discovery of those Mysteries, which, indeed, he long searched into with profest diligence, and study indefatigable.

And this also is an Argument of eminent Candour in Him; that he never invades the reputation of any Author, but every where delivers his own judgement, in mild and friendly language. For, with him it is Proverbial, that That Cause is worthy to be suspected for scarcely good and profitable, which its Author contends for with brawling and fierceness: But Truth can want no Patron.

And when it was easie to him, to have woven this whole Web, from materials of his own; such was his care, for the prevention of Envy, that he yet chose to follow the clue of Aristotle and Aquapendens, as if he had



## The Epistle Dedicatory.

had contributed thereunto no more  
then meerly the Woofe. Of Him I  
shall speak no more, lest I appear to  
praise to his face a Person, whose  
Worth hath advanced Him infinitely  
above my praises; especially to You,  
to whom his Virtue, Candor, and In-  
genie, are long since very well known.  
But, of My selfe, I shall adde onely  
thus much; that in this great Busi-  
ness I have performed no more then the  
meer office of a Midwife: producing  
into the light this noble Issue of His  
Brain, in all its parts and lineaments  
perfect and consummate, as it is now  
presented to your View; but staying  
long in the Birth, & fearing, perhaps,  
some injurious Blast of Envy or De-  
traction. To speak more plainly, I made  
it my Province to oversee and correct  
the Press; and because the Author  
writes so obscure a Hand (A thing,  
as we say, common to learned men (as  
that scarce any man, but who hath bin  
accustomed

## The Epistle Dedicatory.

accustomed thereto, can read it without difficulty, I used all diligence to provide against the Errors of the Compositor, that might be occasioned thereby; which I observed, not to have been duly prevented in the Impression of a small Treatise of the Doctors, not long since set forth.

And thus, most Learned Sirs, have I rendered you the Reason of this my Writing to you; which is, to let you know, that our HARVEY hath Sacrificed to the Benefit of the Commonwealth of Learning, to the Dignity of our Colledge, and to His own Eternal Honour.

Farewel, and Prosper.

To the Incomparable Dr. HARVEY,  
On his Books  
Of the *MOTION* of the *HEART* and *BLOOD*,  
And of the  
*GENERATION* of *ANIMALS*.

**T**O *Sol*, the grateful *Persian* homage payes;  
He *Sees* by them, and so *Adores* the rays:  
Deeming the *Suns* just title to arise  
To th' *Tribute*, as to th' *Vision* of his *Eyes*.  
And such is thy due claime, Great *Light* of *Art*,  
Who to the long-dim *World* dost sight impart.  
To thy *Loud Fame* for ever be apply'd,  
As th' *Conduct*, so the *Glory* of our *Guide*.

While gray *Antiquity* *Oracular* hears,  
Not for the *Truths* she brings, but for the *Yeares*,  
And her sower *Diſſats* from the *Tripod* thrown,  
Look more to be *Obey'd*, then to be *Known*.

Thy



Thy daring Art first stands hier, and doth breed  
This Rescue thence, that Science is not Creed.  
Who for their Age alone doe Writers trust,  
Prize Armour, not for th' Proof, but for the Rust.  
From Books to Nature thy Appeal is made,  
Thy Copies by their Archetype are swayd.  
Though High and Reverenc't thy Authors sit,  
Yet the Creation is thy Classick Writ.  
The various Colonies, whose brood supplies  
Inhabitants to Earth, to Seas, and Skies,  
These are thy Vatican, and onely these  
Are thy Infalible Hippocrates;  
Thy Sibyll Volumes, and Thou knowst them all,  
Like their first Godfather before the Fall.  
Their Natures, Kinds, Distinctions and Consent,  
The Parts contained, and Parts continent,  
Their Order, Substance, Temper, Site, their Force,  
Relations, and confederate Entercourse.

Their different Cells, which different Boxes bound,  
Roof and partition'd from their Neighbours ground.

The Numerous Intrals Thou hast searched  
through,  
Might both Appease the Gods, and Surfet too.

Not in the dull Emerit Carcase, where  
The Shops remain where once the Workmen were ;  
And onely yield this cold Account ; there stands  
The Stuffle and Tools perhaps, but not the Hands.  
But in the Living Laboratories, when  
The Vitals ply'd their task like Lab'ring men ;  
When Life and Industry one Fountaine fed,  
And to give over Work, was, to be Dead.

And now the Beasts hold their Instructive life  
Innobled by the cunning of thy Knife.

Their Fall heares Sacrifice to th' Publick good,  
Nor is it to be Slaine, but Understood.

There thy Observing Eye first found the Art  
Of all the Wheels and Clock-work of the Heart :

The

The mystick causes of its Dark Estate,  
What Pullies Close its Cells, and what Dilate.  
What secret Engines tune the Pulse, whose din  
By Chimes without, Strikes how things fare within.

There didst thou trace the Blood, and first behold  
What Dreames mistaken Sages coin'd of old.  
For till thy Pegasus the fountain brake,  
The crimson Blood, was but a crimson Lake.  
Which first from Thee did Tyde and Motion gaine;  
And Veins became its Channell, not its Chaine.  
With Drake and Candish hence thy Bays is curld,  
Fam'd Circulator of the Lesser World.

Yet thou no sooner wroughtst this wonder out,  
Though proof both gainst the cool suspense of  
Doubt,  
And rougher Violence o'th' Despisers tongue,  
But Europe round with hot combustions rung:  
Its early first Defiance sprung up here;  
At last a swarm of Champion Pens appeare



From *Forreign coasts*, and to the *conflict* come,  
Some thy bold *Challengers*, thy *Seconds* some.  
But when *Experience* vanquish't their *defence*,  
And *Prejudice* was captive led by *Sense* :  
The *Ingenious* laid down Arms, and fled to You,  
As their *Instructor*, and their *Victor* too.  
Thus twice endeer'd, thy *Secrets* we allow,  
By *Truths* at first, and by *Opposers* now.  
So *Gold* disputed, and *Approved* such,  
Comes *Mettle*, but parts *Treasure* from the *Touch*.  
A *Calmer* welcome this *choice Peice* befall,  
Which from *fresh Extract* hath deduced all,  
And for belief, bids it no longer begg  
That *Caster* once and *Pollux* were an *EGGE* :  
That both the *Hen* and *Houswife* are so matcht,  
That her *Son Born*, is only her *Son Hatcht* ;  
That when her *Teeming* hopes have prosp'rous bin,  
Yet to *Conceive*, is but to *Lay within*.

*Experiment, and Truth both take thy part :*

*If thou canst scape the Women ? there's the Art.*

*Live Modern Wonder, and be read alone,*

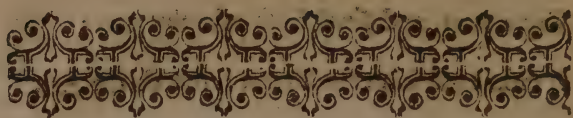
*Thy Brain hath Issue, though thy Loins have none.*

*Let fraile Succession be the Vulgar care ;*

*Great Generation's selfe is now thy Heire.*

**M. LL. M. D.**

---



## THE PREFACE.

¶ Since many have requested, and  
¶ some have importuned mee; it  
¶ will not, I hope, be unwelcome,  
¶ (candid Reader) if what I have  
observed concerning the *Generation of Animals*, out of Anatomical dissections (for I have found the whole matter to be much different, from that which is delivered, either by Philosophers or Physicians) I expose in these Exercitations, in favour, and for the use of the Lovers of Truth.

All Physicians, following *Galen*, teach, that out of the Seed of Male and Female mingled in Coition, according to the predominant power of *this*, or *that*, the Child resembles either *this*, or *that* Parent, and is also either *Male* or *Female*. And sometimes they pronounce the *Males Seed* to be the *Efficient* cause, and the *Females* the *Materiall*; and sometimes again the clean contrary.

But



## The Preface.

But *Aristotle* ( *Natures* most diligent Searcher ) affirms that the *Male* and *Female* are the principles of *Generation*, and that *she* contributes the *matter*, and *he* the *form*; and that forthwith after Coition, there is formed in the Womb out of the Menstruous blood, the Vital principle, and first particle of the future *Fœtus*, (namely, the Heart, in Creatures that have blood.)

But that these are false, and rash assertions, will soon appear; and will like clouds instantly vanish, (when the light of Anatomical dissection breaks forth) nor will they require any elaborate confutation, when the Reader, instructed by his own eyes, shall discover the contrary by ocular inspection; and shall also understand, how unsafe, and degenerate a thing it is, to be tutored by other mens commentaries, without making tryal of the things themselves: especially, since *Natures Book* is so open, and legible.

I have therefore exhibited to publick view, what in these my *Exercitations*, I intend to deliver concerning the *Generation of Animals*; not onely that posterity may thence discern the certain and apparent truth; but also, and that cheifly too, that (by revealing the Method I use in searching into things) I might propose to  
studious

## The Preface.

studious men, a new, and (if I mistake not) a surer path to the attainment of knowledge.

For although it be a more new and difficult way, to find out the nature of things, by the things themselves; then by reading of Books, to take our knowledge upon trust from the opinions of Philosophers: yet must it needs be confessed, that the former is much more open, and lesse fraudulent, especially in the Secrets relating to *Natural Philosophy*.

Nor is there any reason, why any man should be deterred by the trouble of it; if he will but so much as consider with himselfe, that even life it selfe is continued to him, by the never Wearied Agitation of the Heart. Nor truly would this journey present so much of solitude and desart to us; did not most men by the custome (or fault rather) of the age wee live in, yeilding themselves up to sluggishnesse, desire rather to erre with the many, then with the expense of their paines and coine, endeavour to be wise with the few: when notwithstanding the *Ancient Philosophers* (whose industry also even we extol) went a quite contrary way to work; and by indefatigable toile searching after several experiments, have set  
up

## The Preface.

up a clear light to direct our studies. So that, whatever notable and approved thing we have in Philosophy, it all is derived unto us by the paines and industry of ancient *Greece*. Yet when we content our selves with their discoveries, and calmly believe (which is meer sleepiness) that there is now no more place for new inventions, the spritely edge of our owne wit languisheth, and we extinguish the lamp which they lighted to our hands. And certainly he alone wil grant, that the whole truth was ingrossed by the Ancients, (who is ignorant of the many noble discoveries, to pass by other *Arts*) lately found out in the business of *Anatomy*. And this was chiefly done either by such, who wholly intent upon some one thing, did casually descry some other: or (which is more commendable) by those, who following Natures conduct with their own eyes, have at length through a perplexed, but yet a most faithful tract, attained to the highest pitch of Truth. And in such an undertaking it is pleasant, not to be tyred onely, but even to faint away; where the Irkesomness of Discovering is abundantly recompensed by the discovery it selfe. We use, being covetous of Novelty, to wander far into unknown lands, that our  
own



## The Preface.

own eies may witness, what our ears have received at second hand: where yet for the most part

\_\_\_\_\_ *minuit præsentia famam.*  
Our sight decries report.

Let us then blush, in this so ample, and so wonderful field of nature, (where performance still exceeds what is promised) to credit other mens traditions only, and thence coine uncertain problemes, to spin out thorney and captious questions. Nature her selfe must be our adviser; the path she chalks must be our walk: for so while we confer with our own eies, and take our rise from meaner things to higher, we shall be at length received into her Closet-secrets.

### Of the Manner and Order of attaining knowledge.

**T**Hough there be one onely roade to Science, namely, that by which we proceed from things *more known*, to things *known less*; and from that which is *more manifest*, to that which is *more obscure*; and though *Universals* are chiefly known to us (for Science is begot by reasoning from

## The Preface.

from *Universals* to *Particulars* yet that ve-  
ry comprehension of *Universals* in the Un-  
derstanding, springs from the perception  
of *Singulars* in our sense. So that both A-  
ristotles assertions are true, as well that L. 1. c. 2. 3.  
in his *Physicks*; There is a way naturally lay-  
ed from those things which are more known  
and cleare to us, to those things which are  
more intelligible and cleare by nature. For  
the same things are not both known to us, and  
simply so too: wherefore we of necessity must  
thus proceed; to wit, from those things which  
are by nature indeed more obscure, but yet are  
more clearer to us; to those things which are  
more cleare and intelligible by nature. But  
those things are first perspicuous and manifest  
to us, which are most confused. Therefore  
wee must goe from *Universals* to *Singulars*:  
for the *Whole* is more known by sense: now an  
*Universal* is a certain *Whole*. As that in his  
*Analyticks*. *Singulars* are more known by Post. 2.  
us, and doe first exist according to sense: for  
nothing is in the understanding, which was  
not before in the sense. And although that  
*Ratiocination* is naturally first and more  
known, which is made by *Syllogisme*; yet  
that is more conspicuous to us, which is made  
by *Induction*: and therefore we define *Singu-  
lars* with more ease, then *Universals*: for there  
lyes more *Equivocation* in *Universals*. Where-  
fore

## The Preface.

fore we must pass from *Singulars* to *Generals*.

That which we have now delivered, hangs very well together; though at first it seem to clash: because *Generals* are first collected from *Singulars* by *sense*; and so farre onely are more known to us, as an *Universal* is a certain whole and indistinct thing; and that *Whole* is more known to us according to *sense*. For though in all knowledge, we begin from *sense*, because, (as the Philosopher said before) *Sensible* particulars are most known to *sense*; yet *Sensation* it selfe is an *Universal* thing. For (if you minde it well) though (while we perceive) that which is in the outward organ of *sense* be a *Singular*, as suppose, a yellow colour, in the sight: yet that which is thence abstracted by the *internall sense*, and is judged and apprehended by it, is an *Universal*. Hence it comes to pass, that several persons, do at the same instant, abstract *divers species*, and fashion *severall notions*, even of one and the same *Object*. As it is evident in *Poets*, and *Painters*: who, though at the same time, and in the same place, all circumstances being alike, they behold one and the same *Object*, yet each of them, be they never so many, express and describe it a *several way*, according



## The Preface.

29  
ording to the several *Ideas* which they have drawn in their *Phanſie*. So that a Painter being to draw any one mans picture, though he take a thousand several draughts, will make them all *diſtinct faces*; and them too not onely differing from each other, but from the Archetype it ſelfe: yet with ſo ſmall diſtinction, that if you look upon each of them apart, you will think hee ſtill brings the ſame piece hee brought before: and yet ſet them all together and compare them, and you will plainly diſcover a difference. Now the reaſon of all this is, that in *Viſion*, or the *act of Seeing*, each particular by it ſelfe was clear and *diſtinct*: which very particular, the Object being removed, (as ſuppoſe you ſhould ſhut your eyes,) abſtracted in the *Phanſie*, or laid up in the *Memory*, is preſented *obſcure*, and *confuſed*: nor is it any longer apprehended as a *particular*, but as ſome *General* and *Univerſal thing*.

This ſubtilty *Seneca* doth elegantly expreſs, according to *Plato's* opinion. *An Idea*, ſaith he, is an eternal Exemplar of *Natural things*. I will explain this definition, that you may conceive it the better. Suppose I intend to draw your picture, you your ſelf are the Exemplar of that picture, from whom

## The Preface.

whom my minde takes a representation, which she indeavoureth to pattern in her work. So then your face, which is my director, & which I labour to represent, is the Idea. And a little after, he saith. In my discourse even now I made use of a picture-drawer, to illustrate what I was speaking of. He, when he would paint Virgil, his eye is upon Virgil himself: Virgils face is his Idea, and the Exemplar of his future designe: now that which the Artist takes from this Idea, and worketh off, is the Picture. If you demand the difference between these two, it is this: the one is the Pattern, the other is the copy taken by the Pattern, and layed upon the work: He imitates the one, and makes the other. A Statue hath a face, but that face is but the Idos, or representation: But the Exemplar which the Statuary copies out, hath a face, and that face is the Idea. Doe you desire a farther explication? take it thus. The Idos is that which you see in the piece: the Idea is quite without the piece, and not onely without it, but also had a being before the piece was at all. For those things that have been formerly observed, and either by use, or custome have taken deep root in the minde of the Artificer, doe constitute art it selfe, and the Operative Habit: for Art it self is nothing but the reason of the work,

## The Preface.

work, implanted in the Artists minde. And the same way by which we gaine an Art, by the very same we attain any kinde of science or knowledge whatever: for as Art is a habit whose object is something to be done; so Science is a habit, whose object is something to be known: and as the former proceedeth from the imitation of Exemplars; so this latter, from the knowledge of things naturall. The Source of both is from sense and experience; since it is impossible that Art should rightly be purchased by the one, or Science by the other, without a direction from Ideas. Yet in both Art & Science too, that thing which in sensible objects wee perceive, differs from the perception it self, which is kept in the memory, or imagination. That, is the exemplar, the Idea, the forme informing: this, the Representation, the Idos, the abstracted Species. That, is a natural thing, a real entity; this, a resemblance, or similitude, and an ens rationis. That, is imployed about some particular thing, and is it selfe a singular, and an individual; this, is a kinde of universal and common thing. That, is in every Artist and Philosopher, a sensible thing, clear, and perfect; this belongs to the mind, and is obscure. For what wee discover by sense, is much more sure  
¶ and



## The Préface.

32  
and *manifest*, then what we discover by the *Intellect*: because the latter springs from the former, and is illustrated by it. To conclude, *Sensible* Objects are of themselves, and before *Intelligible*; but *Intelligible* are after them, and arise from them: nor can we attain to them at all, without *their* help.

Wherefore it is, that our *judgement* erreth about phantasmes and apparitions comprised in our minds, unless *sense* give a right verdict, established upon frequent observations, and infallible experiments. For in every *Science*, be it what it will, a diligent observation is requisite, and *sense* it self must be frequently consulted. We must not (I say) rely upon other mens experience, but on our owne; without which, no man is a proper disciple of any part of natural knowledge; nor a competent judge of what I shall deliver concerning *Generation*; for without experimentall skill in *Anatomy*, he will no better apprehend it, then a man *born blind* can judge of the nature and difference of *colours*; or one *born deaf*, of *Sounds*. Therefore (discreet Reader) trust nothing I say, about the *Generation of Animals*; I appeale to none but thine eyes. For since every perfect *Science* builds upon those

Prin-

## The Preface.

*Principles*, which it finds out by *Sense*: we must have a special care, that by customary dissections, we be sure those *Principles* are safely grounded. If we do otherwise, we may get a tumid and floating opinion: but never a solid and infallible *knowledge*: As it happeneth to those, who see forraign countries only in *Mapps*, and the bowels of men falsely described in *Anatomical tables*. And hence it comes about, that in this rank age, we have many *Sophisters*, and *Book-wrights*; but few *wise men*, and *Philosophers*.

And thus much I thought fit to premise as a *Taft*, that you may understand; by what helps I my self was assisted, and upon what consideration I was induced to communicate these my *Observations*, and *Experiments*: and that you treading the same path, may be able not onely to be an equitable *Umpire* between *Aristotle*, & *Galen*, but also forsaking al subtleties; and probable conjectures, and viewing Nature in her own glass, may search out many other things yet unrevealed, and perhaps more precious.

*Of the former matters, according to Aristotle.*

**N**O kind of knowledge is innate to us; according to *Aristotle*: For neither  
¶ 2 *Opinion*

## The Preface.

opinion, nor Art, nor Understanding, nor Speech, nor Reason it self, are in us by nature, and from our birth; but all these are of the lineage of those things, which happen to us *from without, according to nature*; As also all those qualities and habits, which are esteemed to be spontaneous, & placed within our own power; such are *Virtues* and *Vices*, for which we receive neither commendation, and reward, or disgrace, & punishment. The knowledge therefore of any thing whatsoever must be our proper purchase. But which are the first principles of this knowledge, is not the scope of this discourse.

Analyt.  
post. l. 1.  
c. 1.

Yet I suppose it will not be amiss, to premise here, Whence, and How we come to know, that we may attain to a more perfect understanding of the *Generation of Animals*, and also take away any scruple, which any man might raise about *Aristotles* opinion. For he affirms, *all doctrine, and Dianoetical discipline to be framed out of precedent knowledge*: Whence it seems to insue, that there is either no first knowledge, or else that that first knowledge is born with us; which is dissonant to what is said before.

13. l. 2.  
cap. ult.

This doubt is hereafter cleared by *Aristotle* himself; where he teacheth the man-



## The Preface.

manner how knowledge is acquired. For having taught, that all certain knowledge is gained by *Syllogism*, and *Demonstration*; and that all demonstrative *Syllogismes*, are built upon some first, true, and necessary principles; he at last inquires, how principles become known, and what is that notifying habit; as also, whether habits are begotten, since they were not in us before; or else, whether they lurked conceal'd, in case they were in us? We have not, saith he, those habits; for it happens that they are hid from those who acquire more exquisite knowledge by demonstration. But if we receive them, when we had them not before, how should we make it known, and how should we learn out of a non-preceding knowledge? It is plaine therefore that we have them not, and that they are not in us, and we not know of them; and that they cannot be begotten in men that have yet no habit at all. Wherefore it necessarily follows, that we have some power to attain them, and yet not such a one as is more excellent, and exquisite then they. Now this seems to be a common thing to all creatures living: to have a connate power of Judging, which is called Sense.

Now since they have Sense, some of them retain in them the things they perceive by sense, and some not. They who retain not,

## The Preface.

have either no knowledge at all, or else no knowledge of what they do not retain, beyond the bare sensation it self. Others do retain in their Soul something of what they perceive. And since there are many such, they are thus differenced; that in some there doth result a certain discourse from the memory of things retained, and in some not. By Sense therefore memory is made, as we say; and out of a frequent remembrance of the same thing, is experience made: (for many numerical Remembrances, are one Experience) but out of Experience, or an Universal resting in the soul (namely out of one, which is distinct from the many particulars, and is one and the same in all of them) is raised a Principle of Art, and Science: of Art, if it relate to Generation; (that is, to doing, or effecting;) of Science, if it appertain to that which is, (that is, to the knowledge of an Entity simply;) so that the habits we speak of, are neither naturally in us, neither are they made out of other habits more known, but they proceed from Sense.

By which words of Aristotle, it evidently appears, by what Order the knowledge of any Art, or Science is attained: Namely, by Sense there remains an impression of the thing perceived: by that impression is made a remembrance of it, and from multiplied memory, proceeds Experience: from

Ex-

## The Preface.

Experience, Universal Reason, Definitions, Maxims, or common Axioms, which are the most certain Principles of knowledge. As for example, *The same thing, under the same capacity cannot possibly be, and not bee. Every Affirmation, or Negation, is either true or false; and so forth.*

Wherefore, as we said before, no perfect knowledge, which may be called ours, is *in us*; but such as is in some sort derived to us from Experience, and Sense; or is at least examined, and approved by them, and strongly grounded upon some knowledge pre-existent in us. For without memory, there can be no experience, which is nothing else but a multiplied memory: neither can memory bee, without a remaining impression of the sensative object, and the object cannot remain, where it never was.

The great Dictator of Philosophy hath <sup>Metaph. l.</sup> another passage to this purpose. <sup>I. c. 1.</sup> *All men naturally desire knowledge. And this is evidenced, by the love of our Senses: amongst which we prefer the sight; because this chiefly conveyeth knowledge to us, and distinguisheth best of things.*

Now naturally Animals are sensative: but some of them remember not what they perceive by sense, and some do. And for this cause



## The Preface.

some are prudent, some are more capable of discipline then others that remember not. Prudent, without being taught; as all those that have not the sense of hearing, as Bees, and all such other kinds of creatures; But all creatures may be taught which have both memory, and hearing too.

Therefore other creatures have phantasies, and memories, but have no title to experience. But Men have Arts, and Ratiocination. And to them experience comes by remembrance: for many recordations of the same thing, make one Experience. Wherefore experience seems much of kin to Art, and Science. For by experience men gain both Art and Science. For Experience begets Art (as *Polus* rightly notes) but Inexperience, Chance.

Apud.  
Plat. in  
Gorgia.

By which he clearly shews, that no man can be truly called prudent, or knowing, who doth not by his own experience (attained by manifold remembrance, frequent sensation, and diligent observation.) know things to be so. For without that, we think onely, or beleive: and such a knowledge as that, is to be reputed other mens, rather then our owne. Wherefore fond and erroneous is that Method of seeking truth, in use in our times: while most men diligently inquire, not what the truth is, but what other men say

## The Preface.

say it is : and inferring Universal conclusions from particular premisses, & thence shaping to themselves irrational deductions, they transmit to us things like truth, for truth it self.

Hence it is, that Sophisters and halfe-knowing men, polling other mens inventions, saucily impose them upon us for their own ; (shifting onely the phrase and order, and adding some impertinencies of their own) and render Philosophy (which ought to be clear and perspicuous) obscure, intricate, and confused. For whosoever they be that read authors, and do not, by the aid of their own Senses, abstract true representations of the things themselves (comprehended in the authors expressions) they do not resent true *Ideas*, but deceitful *Idols*, & *Phantasms*; by which means they frame to themselves certaine *shadows* and *Chimera's*, and all their *theory* and contemplation (which they count *Science*) represents nothing but *waking mens dreams*, and *sick mens phrensies*.

Give me leave therefore to whisper this to thee (friendly Reader) that thou be sure to weigh all that *I* deliver in these *Exercitations*, touching the *Generation of living Creatures*, in the steady scale of experiment ; and give no longer credit to it, then

## The Preface.

De gen. an.  
l. 3. c. 1.

then thou perceivest it to be securely bot-  
tomed, by the faithful testimony of thy  
own eyes. This very thing did *Aristotle* per-  
swade us to; who when he had discour-  
sed much of *Bees*, added at last: That the  
Generation of *Bees* is after this manner, ap-  
pears by reason, and by those things which are  
seen to come to pass after the maner of *Bees*. Yet  
have we not a sufficient discovery of what may  
fall out. Therefore when the discovery shall be  
completed, then is Sense more to be trusted to,  
then Reason. For so far onely is Reason to be  
relied upon, as those things which are demon-  
strated, agree with those things which are  
perceived by sense.

### Of the Method to be observed in the knowledge of Generation.

Since therefore in the Generation of A-  
nimals (as in all other things of which  
we covet to know any thing) every inqui-  
sition is to be derived from its *Causes*, and  
chiefly from the *Material* and *Efficient*; it  
seems fit to me, looking back on perfect  
animals (namely by what degrees they are  
begun, and compleated) to retreat, as it  
were, from the end to the beginning: that  
so at last when there is no place for farther  
re-



## The Preface.

41  
retreat, we may be confident we have arrived at the principles themselves: and then it will appear, out of what *first matter*, by what *efficient*, and what *procession* the *plastick power* hath its original; and then also what progress Nature makes in this work. For both the first, and remoter matter, appears the clearer (being stripped naked as it were) by Negation; and whatsoever is first made in *Generation*, that is, as it were, the *material cause* of that which succeedeth. So, for example, A *Man*, was first a *Boy* (because from a *Boy* he grew up to be a *Man*; ) before he was a *Boy*, he was an *Infant*; and before an *Infant*, an *Embryo*.

Now we must search farther, what hee was in his Mothers Womb, before he was this *Embryo*, or *Fœtus*; whether *three bubbles*? or some *rude* and *indigested lump*? or a *conception*, or *coagulation* of *mixed seed*? or whether any thing else? according to the opinion of writers.

In the same manner, before a *Hen* or *cock* came to perfection, (and that is called a perfect Animal, that can beget its like) there was a *Chicken*; before that *Chicken*, there is seen in the egge an *Embryo*, or *Fœtus*; and before that *Embryo*, Hieronymus *abricius Aquapendens* hath descried the *rudimentary*

## The Preface.

rudiments of the Head, Eyes, and Spine of the Back. But where he affirms, that the Bones are made before the Muscles, Heart, Liver, Lungs, and all the Viscera; and that all the inward parts ought to exist before the outward; he relieth upon probability, rather than experience; and laying aside the verdict of sense, which is grounded upon dissections; he flies to petty reasonings borrowed from mechanicks: which is very unbeseeming so famous an Anatomist. For he ought to have told us what daily changes his own eyes had discovered in the egge, ere ever the Fœtus came to perfection. Especially seeing he professedly wrote the *History of the Generation of the Chicken out of the Egge*; and hath described in pictures what progress is made from day to day. It was, I say, besitting so much diligence, to have acquainted us from the allegation of his own sight, what things in the egge are made first, what last, and what happen together: and not to have confined himself to the example of building of Ships, and Houses, to render a cloudy conjecture and perswasion only, of the order, and manner of forming the parts.

We therefore (according to the Method proposed) will explaine, first in an Egge, and afterwards in other Conceptions of

## The Preface.

of several creatures, what is constituted *first*, and what *last*, in a most miraculous order, & with a most inimitable prudence and wisdom, by the great God of nature; and at length we will discover, what we have found out, concerning the *first matter* out of which, and the *first efficient* by which, the *fœtus* is made, as also of the *order & Oeconomy of Generation*: that thence we may attain to some infallible knowledge of each faculty of the formative and vegetative *Soul*, by the effects of it; and of the nature of the *Soul* it self, by the *parts, or organs of the body*, and their functions.

Now this indeed we could not perform in all kind of *Animals*; because some of them cannot be gotten; and others again are so exceeding small, that our eyes can hardly discern them.

Let it suffice therefore that we have done it in some creatures, which are more known to us; to whose platform, the first originals of all other creatures may be reduced. We have made choice therefore of such, as might render the credit of our experiments lesse questionable, namely larger, and perfecter creatures, and such as are within our own power. For in the larger creatures, all things are more conspicuous.



## The Preface.

Spicuous; in the perfecter, more distinct; and in those that are in our own power, & conversant amongst us, more obvious: so that we have liberty (at pleasure) by searching into them, to rescue our observations from wavering hesitation. And of this sort, in the race of *Oviparous* creatures, are Hens, Geese, Pigeons, Ducks, Fishes, Shel-fish of both kinds (as Lobsters, Oysters, &c.) Fishes that have no shells at all, Frogs, Serpents: also Insects, as Bees, Wasps, Butterflies, Silkworms. And of *Viviparous*, Sheep, Goats, Dogs, Cats, all Cattel that divide the Hoofe; and in chief, the perfectest of all creatures, Man himself.

Having thorough insight & knowledge of these things, we may then contemplate the abstruse nature of the *Vegetative Soul*; and discern in all creatures what ever, the manner, order, and causes of their Generation: because all other creatures agree either generically, or specifically with the fore-cited, or at the least with some of them; and are procreated after the same manner of generation, or else in a manner proportioned to it. For *Nature* being divine, and perfect, is always consonant to her self in the same things. And as her works do either agree or differ (namely in kind, speci-

## The Preface.

es, or some analogy) so her operation (that is to say, generation or Fabrick) is the same or different in them. Whoever entereth this new, and unfrequented path, and inquires for truth in the vast volume of *Nature*, by Anatomical dissections, and experiments, he meets with such a croud of observations, and those too in such exotick shapes, that to unfold to others the mysteries himself hath discovered, will be more toyl, then the finding of them out: for many things occur which have yet no name; such is *the plenty of things, and the dearth of words*. So that if a man should cloath them in Metaphors, and express his new inventions by old words, and such as are in use: the Reader could no more understand them, then *canting*: and would never be able to comprehend the business, since he never saw it.

And then again to mint up new and fictitious terms, would rather cast a mist, then enlighten. For so he must needs express things unknown, by that which is lesse known: and the Reader would be more afflicted to unriddle the *words*, then to understand the *matter*. And therefore *Aristotle* by unexperimented persons is thought obscure: And this perhaps was the reason, why *Eabricius ab Aquapendente* chose

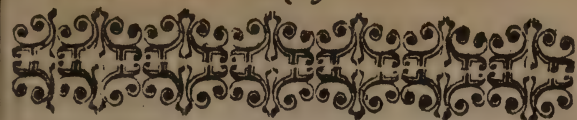
## The Preface.

chose rather to describe the Fabrick of the Chicken in the Egge by *tables* then *words*.

Therefore be not offended, Courteous Reader, if in setting out the *History of an Egge*, and in the description of the *Generation of the Chicken*, I make use of a new method, and sometimes of unusual terms; nor think me hereby more desirous of vain-glory, then of advantaging others by true experiments, and such as are grounded in Natures self. To take off that prejudice, know, I tread but the steps of other men who have lighted me the way, and (so farre as is fit) I make use of their notions. But in chief, of all the *Ancients*, I follow *Aristotle*; and of the later Writers, *Hieronimus Fabricius ab Aquapendente*, Him as my *General*, and This as my *Guide*. For as they which finde out *new Plantations*, and *new Shores*, call them by names of their own coyning, which *Posterity* afterwards accepts and receives; so those that finde out *new Secrets*, have good title to their compellation. And here, me thinks, I hear *Galen* advising; *If we consent in the things, contend not about the words*:

of





OF  
GENERATION.

*The Reason why we begin with  
a Hennis Egge.*

EXERCITATION I.



*Ieronymus Fabricius Aquapendens* (whom, as I said before, I have chosen for my guide) in the beginning of his Book concerning the formation of the Egge and Chicken, hath these words: My purpose is to treat of all sorts of formation of the fœtus,

taking my rise from that which proceeds from an egge; For this ought to precede all other discourses of this nature, in that it not only befriends us with a more easie discovery of Aristotles thoughts concerning this matter, but because the Treatise of framing the fœtus out of an egge is much the fullest, and exceeds the other both in extent, and difficulty.

But we begin our discourse from the history of an Egge, both for the reasons by him recited, and likewise, because we may thence borrow more infallible grounds, which (in regard they are more

B

known

known to us) may enlighten us to contemplate the *Generation* of any other *Animals*. For since *Egges* are a cheap merchandize, and are at hand at all times, and in all places; it is an easie matter to observe out of them, which are the first evident, and distinct ground-works of *Generation*; what progress nature makes in *formation*, and with what wonderfull providence shee governes the whole worke.

*Fabricius* goes on: That the contemplation of framing the *fœtus* out of *Egges* is the largest of all, appears in this, that the greatest part of animals are begotten of *egges*. For to pass by almost the whole race of *Insects*, and imperfect *Creatures*, which sense it self discovers to spring from *eggs*; even the most part of perfect productions are of that extraction. Hither he referreth, All sorts of *Birds*; and of *Fishes* too; (bating only *Whales*) also *Crusted-fish*, *Shell-fish*, and *Fishes* without scales; and amongst *Terrestrials*, all *Creeping things*, *Creatures* that have numerous feet, and also all kindes of *Serpents*; and amongst four-footed *Beasts*, all sorts of *Lizards*.

But we pronounce (as shall appeare hereafter) all animals whatever, even *Viviparous* also, nay man himself to be made of an *EGGE*: and that the first conceptions of all living creatures which bring forth young, are certain *Egges*, just as the first conceptions of all *Plants* are certain seeds. And therefore *Empedocles* rightly stiled the seeds of *Plants*, a sort of *Egges*. The history therefore of *Egges* is most spacious, because it yields an insight into all kinde of generation.

Wherefore of an *EGGE*, we shall first shew, *where*, *whence*, and *how* it is made. And then, by what means, order, and degrees, the *fœtus* or *chicken* is fashioned, and perfected in the *EGGE*, and of it.

Here

EXER. I. a Hennes Egge.

3

Here again Fabricius : The productions of Animals do some of them spring out of Egges, some out of Seed, and some out of Putrifaction; and hence it is, that some are called oviparous, some viviparous, others the issues of putrifaction, or creatures born of their own accord; by the Greeks, *αὐτοῦαα*.

But I dislike this division; because all Animals may in some sort be said to be born out of Egges, and in some sort out of Seed: besides, they are stiled Oviparous, Viviparous, or Vermiparous, rather from the issues themselves bring forth, then from the original matter of which themselves were made; namely, because they produce an Egge, a Worm, or a living Creature. Some of them are also said to be *sponte nascentia*, creatures born of their own accord, not because they quicken out of putrid matter, but because they are begotten by chance, by natures own accord, and by an equivocal generation, (as they call it) and by parents of a different species from themselves. For other Animals also do bring forth an Egge, or a Worm, as their Conception, and Seed; out of which, after they have exposed it to the wide world, they produce a fetus, and so are named Oviparous, or Vermiparous. But now the Viviparous are therefore so called, because they retain and cherish their conception, or seed, so long within their own bowels, till the fetus come forth shaped, and alive.



## Of the place of Generation.

## EXERCITATION II.

**N**ature (saith Fabricius) was first solicitous of the place, which she at length decreed to be either within the Animal, or without it; and appointed the womb to be the place, within the creature; but without, the egge: in the womb, nature generates of seed and blood; but, in the egge, of such parts as the egge is made of.

For whatsoever is begotten of seed properly so called, is begun, and perfected, either in the same place, or in a diverse. All *Viviparous* creatures have both their original and perfection in the womb itself; but all *Oviparous*, as they have their foundation within their parent, and there become an egge; so are they compleated into a *fetus*, when they are divided from their parent. And, in the Catalogue of these, some creatures continue their eggs so long within themselves, till those eggs be ripe, and accomplished: and thus doe *Birds* and *Beasts* too, as many as bring forth eggs; and *serpents* likewise. But others againe expose their seed whiles it is yet unperfect and immature, to acquire its growth, perfection, and ripeness from abroad: and thus do many sorts of *Fishes*, *Frogs*; also *Fishes* without scales, and both sorts of *Shell-fish*, and *Snails*, whose eggs, when first excluded, are but *designes* or *beginnings*, being *yelks* onely, which do afterward invest themselves with *whites*, and by degrees attracting, concocting, and affixing aliment to themselves, become perfect seed, and a compleat egge. And of this kinde also is the

(See

R. II. **EXER. III. Of the Ovary, or Upper part &c.**

5

seed of *Insects* (which *Aristotle* saith is a *Worme*) which being exposed incomplete at the first, seek their own food, and so thrive, and enlarge, from an imperfect *egge*, to a perfect *egge*, and *seed*. But the *Henne*, and all other *Oviparous* creatures, doe lay a perfect *egge*; of which, from without the womb, they hatch a *fetus*. And for this cause *Aquapendens* mentions two places assigned to generation; one *Internal*, namely the *womb*; the other *external*, which he calls the *Egge*. But (in my opinion) he might, upon better grounds, have called the *Nest*, or *Repository*, the *external* place; because in that the exposed seed is cherished, ripened, and hatched into a *fetus*. For the *Generation* of *Oviparous* creatures, is mainly differenced by their *Nest*. Nor is it less then admirable, that such little creatures should make choice of these receptacles with such exquisite prudence; and shape, build, guard, and conceale them, with such unimitable art and contrivance: whence we must needs conclude (with the Poet treating of Bees) that they are endowed with a portion of divine inspiration: and that we may easier admire their uninstructed art and prudence, then attain unto it.

---

Of the Ovary, or upper part of  
the *Henns* womb.

**EXERCITATION III.**

**T**He womb of the *Henn* is divided by *Fabricius*, into the *Upper*, and the *Lower*; the *Upper* hec names the *Ovary*.

B 3

The

The seat of the Ovary is next under the Liver at the spine of the back, above the descending trunk of the great Artery. For just in that place where in bigger sanguineous creatures, the *Celiacal artery* goes into the *Mesentery*, namely, at the original of the *Emulgent* veins, or a little lower; and in that place where the preparing seed vessels which go down to the *Testicles* have their rise, in all other sanguineous & viviparous creatures; & where also the cock wears his *Testicles*, there is the Hens Ovary found. For some Animals have their stones hanging out, others conceal them about the *Loins* within; in a middle space as it were, at the beginning of the preparing vessels. But the Cock hath his stones immediatly adjoined to the *vasa preparantia*, as if his seed wanted no preparation. Aristotle indeed saith, that the *EGGE* is begun at the midriffe; but we, saith *Fabricius*, in our treatise of Respiration, deny that Birds have any midriffe at all. Which difficulty is thus resolved: Birds are not quite destitute of a midriff; because they have a thinne membrane instead of the midriff; which *Arist.* calls *cinctum*, or *septum*: but they have no musculous midriffe, as other Animals have, neither is it used by them for Respiration. But, to say truth, Aristotle acknowledged no muscles at all.

Thus, in one and the same breath he accuses the Philosopher, and excuses him too: yet hee himself is in an Errour the while. For it is certaine, that Aristotle did acknowledge muscles (as we have elsewhere observed, and demonstrated) and also that membranes in Birds (which are not onely placed transversly to gird the body, but are also extended according to the longitude of the belly) do supply the place of the *diaphragma*, or midriff, and do conduce to respiration: as in another place in our Exercitations, concerning the Respiration of animals,



EXER. III. of the Hennes womb.

animals, we have clearly proved. And, to say no more at present, *Birds* do not onely respire with much more facility then other creatures, but in their songs doe tune and accent their voices with manifold variety: yet, notwithstanding all this, their *Lungs* are so knit to their ribbes and sides, that they can be but very little dilated, raised up, or contracted. Besides all this, (though no man to my remembrance hath ever observed so much before) their *Bronchia*, or extremities of the rough *Artery* are hollow as far as the very *abdomen*, and they treasure up the inspired aire in the cavities of their *membranes*. Even as *Fishes*, and *Serpents* draw the aire into large *bladders*, which are seated in their *abdomen* or belly; and so reserve it, and by that means are conceived to swim the better: and as *froggs*, and *toads*, in the Summer time when they breathe most, doe imbibe much more aire then at other times into their numerous *vesicles*, (which occasions their wondrous swelling) that so they may afford more liberall exspirations in their croaking: So in *Birds*, the *Lungs* seem rather a thorough-fare, and a passage for breathing, then the adequate organ of it. Which had *Fabricius* observed, he would not then have denyed, but that those membranes (at least with the assistance of the muscles of the belly) doe serve for respiration, and execute the office of a *diaphragma*: since even that is not a respiratory organ, without the help of the muscles of the belly; though it have also another employment in those creatures in whom it is muscular, and fleshy; Namely, to depress the *stomack* enlarged with meats, and the *guts* distended with winde and excrements; lest the *heart* and *lungs* should be straitned by their intrusion, and the closet of life it selfe invaded. Now, since there is no fear of any

such mischance in *Birds*, their midriffe is membranous, and exceeding advantagious to the work of respiration; and for this cause they are said to have a *diaphragma*. Moreover, were birds quite destitute of a *diaphragma*, yet *Aristotle* were not to be blamed, for saying, That Eggs receive their first rudiment at the *septum transversum*; for by this name he onely points at the place where the *diaphragma* is commonly found in other *Animals*. So we also say, that the *Ovary* is situate at the beginning of the preparing spermatical vessels, though a *Henne* hath no such vessels at all.

The Perforation of the *Lungs*, by me first discovered (of which I made mention but now) is in no sort dark and obscure; but, in *Birds* especially, very patent: so that in an *Ostrich* I found many perforations, into which I could easily thrust the top of my finger. In a *Turkey*, nay in an ordinary dunghill Cocke, and almost all *Birds* whatsoever, a probe being put into the winde-pipe, will finde an open and wide passage, clean through the *lungs* into the cavities of the *abdomen*, or lower belly. Blow the aire into their *lungs* with a pair of bellows, and you shall finde it hasten into the lower parts, and that not without a sensible force.

Nay, we may very well question whether, even in *man* whilst he is living, the air doth not penetrate into the cavity of the chest, by the aforesaid passages. For could otherwise the putrefied matter of *impostumated*, and the blood shut out of the veins of *pleuritical* persons, flow from thence? How could the aire, when the *breast* is wounded (though the *lungs* be untouged) rush out of the wound? or how could *injections* cast into the cavity of the chest, be returned again with the spittle? But of this at large in our *Exercitations*, of the

EXER. III. of the Hennes womb.

9

the Causes, Instruments, and Use of Respiration.

I return now to the Ovary, and the upper part of the wombe of the Henne; in which the first rudiments of the Eggs are conceived, which are (according to Aristotle) small at first, and white; but increasing, afterwards become of a pale yellow.

As for this upper womb mentioned by Fabricius, the truth is, there is no such thing at all, till the Henne have conceived, and hath the principles of Eggs within her, which may then be properly called a cluster of wheals. And therefore he saith very rightly: The superiour matrix is nothing else but almost an infinite crowd of yolks, which are amased in one heap together, being of a round figure, and of diverse magnitude; amongst which there is a like difference from the greatest to the least, as between a grane of mustard-seed and a walnut; or a medlar. This multitude of yolks are united and knit together as it were upon a bunch: and therefore I call it a Vitellary, or a bunch of yolks, because it much resembles a bunch of grapes. As Aristotle also said of fishes that want scales, where he writes, That their eggs are laid as if they were glexed together like grapes; for as in a bunch of grapes, the berries are some biggest, some less, and some least of all, and each is tyed to its proper sprig, so is it in the Vitellary.

But now in Fishes, Frogs, hard or cruisted Shell-fish, and Snails, the matter is much otherwise; for they contain in them Eggs of the self-same magnitude; which being discharged, do grow alike, are perfected alike, and at the same time produce yong ones. But in the Ovary of a Henne, and almost of all other Oviparous creatures, there is a distinct increase of the yolkes, from almost an invisible smalness, till they arrive to a complete magnitude: though the Eggs of Hennes (not unlike the eggs



eggs of those creatures which conceive and lay their egges together) are hatched into *chickens* in the same nest, almost at the same time. Yet in *Pigeons* (which lay, and hatch onely two egges at a time) I have observed all the Eggs in the Ovary to be of a like magnitude, excepting only those two which were greater then the rest, and were now ready to descend into the *second uterus, or womb*; so that of them there is great increase, not by the multitude of their young at once, but by the frequency of their repeated births, which happen every moneth. So in cartilaginous Fishes; as the Thorn-back, the Fork-fish, the Dog-fish, &c. two eggs are only ripe at a time, and falling down on both sides from the *right and left horn*, they are cherished in the *lower womb*, and exclude their young alive (as the *Viviparous* creatures do :) yet in their Ovary they have almost an infinite number of eggs, and of different dimensions; in the Thorn-back I have numbered above a hundred.

But the Eggs of other *oviparous* creatures are either perfected when they are out of the *womb*, as the eggs of fishes; or at least concocted, as the eggs of snailles, of hard shell-fish, and of spiders. The snailles they treasure up their eggs in froth; cruisted shell-fish, (as shrimps, cray-fish, lobsters) carry them about fastned to their finnes; but the spider beareth them about with her, as it were in a basket wrought of her *webbe*, and so cherisheth them. The Beetle wrappeth her eggs in dung, (rowing them in it with her hinder leggs) and so layeth them up: and, in all these, there are an incredible number of eggs. Fishes have two oblong bladders, or bags, as you may see in the Carp, the Herring, and the Smelt; in all which, as there is no womb at all discernable, besides the Ovary, so is this

EXER. III. of the Hennes womb.

11

this *Ovary* sometimes so thronged with eggs, that it far exceeds the bulk of the whole body besides.

Of the *Ovaries* of these *Carps* and *Mullets*, amass'd together, and salted, and hardned in the smoak, is made that kinde of meat so much in request with the *Greeks* and *Italians* (called by these *Botarcha*, by the *Greeks* ὠὰ ῥάειχα, that is to say, pickled eggs) such as is that which is found in our red *Herrings*, & the red and compacted seed within a *Lobster*. That meat which is made of the salted eggs of *Sturgeon*, is called *Caviare*, which resembleth black sope, and is the delight of gluttons.

In all *fishes* (which have a numerous offspring) so great abundance of eggs is generated, that the whole capacity of the belly can hardly contain them; when they are newly conceived, much less when they are of any growth. And therefore in *fishes*, saving their *Ovary*, there is no other part dedicated to generation. For their eggs take growth abroad; nor need they any womb for that office. And this *Ovary* seems to carry some Analogie to the testicles, or litle seminal bladders, not only because they are found in that place where the stones are bred in males; (for the stones in *Cocks* are scituate, as we have said, at the ingress of the *Cœliacal* artery, neere the midriff, and there the *Hens Ovary* is found) but also, because in both sexes of *fishes*, at the time of generation, there are two litle bags passing through the whole belly, alike in site, figure, and magnitude; which increasing at the same time, are filled, in males with a similiary, spermatical, and milky substance, (whence it is called *fishes milke*) and in the females, with litle invisable graines or sands; so that in the beginning of conception (by reason of their close fabrick) they look like a similiary

milar body, and like the males milk regularly coagulated, and may afterwards be discerned like the smallest sands clinging together in their proper bags.

In lesser Birds (which bring forth egges, and those few ones, but once a year) you will scarce finde any *Ovary* at all; but just where the *stones* hang in males, there in females, instead of an *Ovary*, are found three or four bubbles (according to the number of *egges*, whose foundation they are) as discernable as the *testicles* of the males.

In the horns of the Serpents womb (which are like the *spermatical vessels* of the males) appear the first rudiments of the *eggs*, like little balls fastned on a string, as is usual in womens bracelets, or chaplets of beads made of amber.

They therefore that are found in the *Vitellary*, or *Ovary*, are not to be counted perfect *eggs*, but the first ground-works or rudiments of *eggs*, which are in such order and magnitude disposed in the bunch, that one may daily succeed the other, to supply the *hennes laying*. But no *egge* in the *Ovary* is cloathed with a white, for onely yolks are found there; which, as they gain growth, get without the small ones; that being arrived to a larger room, they may the better thrive and enlarge. And therefore that of *Fabricius* is very true, where he saith, *The greater yolks of the bunch are in the surface, the lesser are in the middle, encompassed as it were by the greater; lastly, the least of all lie undermost.* For as they get greater bulk by growing, they are separated from their fellowes; which, while it is doing, every *yolke*, besides his proper coat, borroweth another from the *Ovary*, which encompasseth it without, and tyeth it to the foundation from whence it sprung: wherefore by *Fabricius* it

is



### EXER. III. of the Hennes womb.

13

is called *pediolus*, five *pedunculus*, the stalk, because by its means, as the fruit draweth nourishment and increase from the tree, so doth the yolk from the cluster. For this stalk is a membranous hollow fastening, which is extended from the bottom of the cluster to the yolk: which so soon as it arrives at, it is dilated, and (just as the optick nerve is spread in the eye) covereth the yolk with an outward coat. Hence Aristotle probably called it *σίλον ὀμφαλώδην*, that is, the little umbilical appendix, or pipe. This little stalk conveys with it many vessels into the yolke, through which they are many waies divaricated.

De Gen.  
An. l. 3. c.

These things are indeed truly delivered by Fabricius, but he mistaketh, when he saith, *This coat doth not environ the whole yolke, but onely a little more then half of it, just as the cover of an acorn, called the cup: whence it cometh to pass, that the outward part of the yolke, being deserted by the fore-mentioned membrane, is exposed to the view without veines, and appeareth naked.* For it embraceth all the yolk; but in the outward part of the yolk, it is not easily discerned from its own coat, because they both are very thin. But, in the fore-part, where the yolk respecteth the foundation of the cluster, this coat adhereth not to the yolk, neither doth it send any veines into it, but only begirts it like a bag.

Every yolk assumeth a particular coat from the same foundation; and therefore this place is not to be reputed the common womb, since nothing is here to be found, beside the cluster, or heap of many eggs, of different magnitude, arising from the same foundation.

Now this Foundation is a particular body of it self, arising at the spine of the Fowle, annexed to the great Artery and Vein, being loose, porous, and fungous, that so it may produce divers yolks out of

it

it self, and afford each of them their coats; which coats do afterwards stretch, as the yolks enlarge, and inclose them like a Bag, with a narrow neck, but a large belly, in like manner as glass-vials are fashioned by the breath of the Glass-maker. Fabricius saith further; The yolks, as they spring from a very small original, being about the magnitude of the seed of Millet, or Mustard, so they are very little, and white, as Aristotle observes, and do also increase by degrees; and, as the same Aristotle saith, grow like yolks, and yellow, till they attain the just magnitude which every body knoweth them to be of. But I have observed them to be much less then the seeds of Millet, even as slender as the smallest wheals, or spots, or sands, (such as I have told you are found in the Ovaries of Fishes) scarce to be discovered by the eye it self, as if they were onely the ruggedness of the membranes of that part from whence they proceed.

### Of the Infundibulum, or Tunnel.

#### EXERCIT. IV.

THE next part of the Womb of the Hen, is by Fabricius called the *Infundibulum*: for it is like a Tunnel, or Trumpet, tending down-ward from the Ovary, (which it every where encompasseth) and growing wider by degrees, is terminated in the superiour production of the Womb.

This *Infundibulum* doth afford a passage to the yolks (when their stalks are broken off) into the second womb (as Fabricius thinketh) and resembleth the *Tunica vaginalis*, or coat of the Testicles in the

the *Cod*, consisting of an exceeding thin *membranes* and easie to be dilated, that so it may entertain the *yolks* which dayly rowle thither, and conveigh them into the aforesaid *Uterus*.

Do you desire an *Illustration* of this matter? fashion in your minde a very slender plant, whose knobby roots may represent the cluster of *yolks*, and its trunk the litle *vaginal*, or *sheath-like pipe*: as the *stalks* of that herb do in the winter *dye*, and vanish away; so, in like manner, when the *Hen* ceaseth to lay any more *egges*, the entire *Ovary*, together with the *Infundibulum*, are retired, and abolished, and (like useles things) quite dried up; leaving onely the *fundamentum* remaining, and some tracks and footsteps of their roots.

That this *Infundibulum* doth onely supply the office of a *thorow-fare*, is hence enough evinced, in that the *yolke* is never found residing in it: but as the *Testicles* sometimes do through the *Tunica vaginalis* creep upwards into the *Groin*, and as those *Testicles* are in some creatures (as the *Hare* and *Mole*) hidden within the *Abdomen*, and do from thence again return and descend; so by the *Infundibulum* do the *yolkes* slide down from the *Ovary* into the *Uterus*; and it supplieth the place of that *Tunnel* (as it also hath its form and shape) through which liquors are transmitted, from one *vessel* into an other of a narrower neck.

of



*Of the Exterior part of the  
Uterus of the Henne.*

## EXERCIT. V.

**F***abricius* prosecuteth the description of the *Uterus*, after the *Ovary*, and so by a perverse method, premitteth the treatise of the *superiour part*, and *production* of the *womb*, to that of the very *womb* it self. And is also too precise and conclusive in assigning three *circles* to it, and in determining their certain situations, when indeed themselves are uncertain. And there also he doth preposterously repeat the definition of the *Infundibulum*.

Give me leave therefore to propose here my *Observation*, and history of the *Uterus* of the *Henne*, (which I apprehend to be more commodious, according to *Anatomical* method) and to proceed from the *outward* parts to the *inward*, (contrary to the course of *Fabricius*.)

In a *Henne* that is plucked, you may perceive the *Fundament*, not (as in other creatures) gathered up into a ring, but having a depressed orifice divided transversely, shrunk up as it were into two lips, the superior of which gathereth the inferior into it, and so covereth and concealeth it. That uppermost lip, or covering, ariseth from the root of the *rump*; and, as the upper eye-lid covereth the eye, so doth this the three orifices of the *Privity*, (namely that of the *Fundament*, of the *Uterus*, and of the *Ureters*) which lye retracted under this covering, as under a *prapuce*, or *fore-skin*: as in the *Lap* of a *Woman*, the passage into the *womb* and *bladder* is

vailed

vailed by the *labra* of the privy, and the parts called *Nymphae*; so that, without *dissession*, or at least some forcible retraction of that covering, neither the passage of the *Excrements* out of the *guts*, nor of the *Urine* out of the *Ureters*, nor of the *Egg* out of the *Uterus*, can appear in a *Hen*. And therefore those two *excrements* (namely the *Urine*, and the *Dung*) are rejected both together, as out of a *receptacle* common to them both, by lifting up of that covering, & so disclosing the *perforation*: and so likewise in *coition*, the *Hen* unvaileth her *lap*, and accommodateth it for the *Cock* that treadeth her: as *Fabricius* observed in a *Turkey-Hen*, which courted a *Cock*. I have seen an *Ostrich-Hen* (when her *Keeper* gently stroked her back, with designe to inflame her) groveling on the ground, list aside that *vaile*, and expose and stretch out her *lappe*; which the *Cock* perceiving, being instantly cupid-struck, proceeded to tread her; and having one leg on the ground, and the other on her back, with an exceeding large *Yard* (of the dimensions almost of a *Neats-tongue*) pursued his attempt: great was the noise and clamours on both sides, and their necks often extended and retracted, and many other expressions of content. Nor is this proper to *Birds* onely, but common also to other *Creatures*, which by removing aside their *Taile*, and extending their *Lap*, prepare themselves to receive the *Male*. So that the *Tail* in other creatures seems to be almost of the same use, with the *Vail* in the *Hen*, which, unless it be removed, or lifted up, there is neither passage for the *excrements*, nor the addressees of the *Male*.

In *Hinds* and *Does* (as if they were more severely chaste then other beasts) such a skreen of modesty, and skinney covering, shrowdeth both the *lap*,

C

and

and passage of urine, which must of necessity be lifted up, ere they can have conversation with the Male. In Beasts also that have *tailes*, there must be an elevation of them, before they can bring forth their young. And *Midwives* also, by unction and retrusion of the extremity of the *os sacrum*, do facilitate *womens labours*.

A certain *Chirurgion* of my acquaintance, an honest man, being returned from the *East-Indies*, told me upon his credit, that in the Island called *Bornea*, in the Inland and Hilly parts of it, there are a race of men born with *Tails*, (as *Pausanias* writes of another place) and that he saw a *Virgin* of that flock, whom they had much ado to catch, (for they are *wilde*) who had a *fleshy, thick tail*, a *span* long, reflected between her leggs, to conceale her modesty : such care hath nature to hide those parts.

The fabrick of this *Covering* in a *Hen*, is like to that of the upper lid of the eye, composed of *skin*, and of a *fleshy* and *musculous membrane*, with *fibers* every where drawn from the circumference to the Center ; and its inward *superficies*, like that of the eye-lid, and *fore-skin*, is soft. It hath also in its extremity a *semicircular* small *gristle*, like the *Tarsus* of the eye-lid : and, beside that, between the *skin*, and *fleshy membrane*, a *cartilaginous interstitium*, from the root of the *rump* joined in a right angle to the *semicircular Tarsus*, or *gristle* : (as *Batts* have a kind of little *taile*, concealed under their *membranous wings*) by reason of which composition, this covering doth, as it were with a *taile*, shelter and

The Perforations in the Fundament of a Hen.

hide the perforations of the privities. Wherefore, no sooner is this protection cut away, but certain perforations appear, whereof some are more apparent, others more obscure. The more

visible,



EXER. V. of the Uterus of the Henne.

19

visible, are that of the *fundament*, and the *lap*; namely, the passage of the *excrements*, and the entrance into the *womb*: the *obscurer* are, as well that through which the *urine* flowes from the *kidnies*, as also that smaller one found out by *Fabricius*, into which (saith hee) the *Cock* doth immit his seed; which *cavity* notwithstanding *Antonius Ulmus* a diligent dissector in *Aldrovandus* did not own, nor any one else besides *Fabricius*, so far as I know. These *Holes* are all so neer neighbours the one to the other, that they seem all to consent and pass into one and the same *cavity*; which (because it lies in common both to the *excrement* and the *urine*) may be called the *Sink*; because, in it, the *excrements* of the *guts*, together with the *urine* descending from the *reines*, are mixed together, till they be together excluded. And through this the *egge* also passing forth, worketh its way.

The Sink.

The making of this *cavity* is such, as if both the *excrements* descended into the *Bladder*, and nature did abuse the *urine* into a natural *clyster*. And therefore it is something thicker and ruggeded then the *gut*, and also in *ejection* and *coition*, thrusts iz self out, (the covering, as I have said, being removed) and hangeth out like the inside of the *gut*: and at that time all the *holes* appear distinctly; which presently again upon its retraction, being collected as it were into a *purse*, are hidden out of sight.

The more conspicuous *Holes*, (namely that of the *fundament*, and the *lap*) obtain a contrary situation in all *fowles*, from all other *creatures*; for in these, the *Pudendum*, or female *genital*, is seated foremost, between the *right gut* and the *bladder*: but in those, the passage of the *Excrement* is placed foremost,

The situation of the orifice of the womb.

The Per-  
foration  
of the  
Purse, so  
called by  
Aqua-pen-  
dens.

most, and between that passage and the *rump*, the passage into the *matrix*.

But that *Hole* into which *Fabricius* thinketh the *Cock* doth cast his seed, is discovered between this doore of the *matrix*, and the *rump*. But, for my part, I acknowledge no such employment of it; for, in *Pullets* or young *Hens*, it is hardly found at all; but in grown *fowle* it is promiscuously as well in the *Cock* as in the *Hen*. And, besides that, this *hole* is very small and obscure, and cannot therefore be imagined to be of so concerning an office; for it scarce admits the point of a small *needle* or a slender *hair*, and terminateth also in a blind and obscure *cavity*: nor could I ever perceive any *seminial humour* at all in it; though *Fabricius* affirmeth, that the *semen* is there reserved as in a *purse*, for a whole year together, and that in the interim all the *eggs* receive *secundity* from thence, as shall be discoursed hereafter.

The pas-  
sage of U-  
rine in a  
Hen.

All *Birds*, *Serpents*, *Four-footed beasts*, which are *Oviparous*, and *Fishes* also, (as is evident in *Carps*) are endowed with *Kidnies* and *Ureters*, through which the *Urine* floweth: which *Aristotle*, and other *Philosophers* hitherto knew not. But *Birds*, and *Serpents*, whose *Lungs* are *fungous*, have but very little *urine*; because they drink but little, and that by *sips*; and therefore they need no *Bladder* of *Urine*, but do deposit it (as we have said) into the common *sink* and *receptacle* with the dryer excrements. But in *Carps*, and some other *fishes* I have found a *Bladder* of *Urine*.

In a *Hen*, the *Ureters* descend from the *Kidnies* on both sides, (which *Kidnies* are large and ample, and seated in the cavity or hollow of the back) and do end in the cavity or common *sink*. But their  
Out-let

EXER.V. of the Uterus of the Henne.

21

Out-let is so obscure, and concealed in the very entrance of the cavity, that to discover it from without, or to search it with the most slender probe, is altogether impossible. Nor is it indeed any great wonder; for in all creatures, even in the greatest of all, the insertion of the Ureters near the neck of the Bladder, is dark and winding, that (though urine, nay and stones too do sometimes glide through them into the bladder) not so much as the aire it selfe can go back that way, nor the urine, be it never so much forced.

All these things are clear in an Ostrich; in which I have found, beside the outward orifice of the common cavity, which was veiled by the Covering; another orifice within the Fundament, which was round and gathered up, and shut as it were with a sphindler muscle. But to pass these, and return to our purpose.

The Orifice of the Womb, or Lap; namely the passage out of the publik cavity into the womb of the Hen, is as it were a certain soft protuberance or rising, loose, wrinkled, and orbicular; just like the end of the Fore-skin closed up, or a prominence of some interiour coat of the matrix. But it is scituate (as I said before) between the perforation of the fundament and the rump, tending something to the left hand; which *Ulysses Aldrovandus* conceives so to be disposed, for more convenient coition, and more commodious reception of masculine incursion.

The Orifice of the Uterus.

But I have often observed, that the Hen doth indifferently incline her back parts towards the Cock, on which side soever he prepare his ascent, be it on the right or left. I finde no Penis, or Yard at all in a Cock, neither could *Fabricius* finde any, though it appear most manifest in Drakes, and



*Ganders.* But, instead thereof, I finde an *Orifice* in a *Cock* (not different from that of a *Hen*) but it is less, and narrower; which *Orifice* is likewise found in the *Swan*, the *Drake*, and the *Gander*: but the *Penis* of the *Drake* and *Gander* (in the act of *Coition*) is sent out of this *orifice*.

In a black *Drake*, I saw a *Penis* of that extent, that after *coition*, the *Duck* pursued it as it trailed upon the ground, with intent to devour it; (deeming, as I suppose, that it had been a *worm*) which occasioned the *Drake* to retract it sooner then his custom is.

In a *Male-Ofirich*, I found, within this *orifice* of the *Privy-part* a very large *glans*, or nut of the yard; and a ruddy *nerve*, of the form and magnitude of a *Deers tongue*, or small *Neats tongue*; which I observed him many times brandish in *coition*, stiffe, and something embowed: which, when he had dispatched into the *female*, he detained there a good space, without any commotion of these parts at all, as they had been staked together; yet all the while strange were the *gesticulations* of their *Heads* and *Necks* (as if they had approved their *Nuptials*) proclaiming their full complacence.

I have read in *D. du Val*, a most learned Physician of *Rouen*, that a certain *Hermaphrodite* was delivered up to the *Chirurgians* and *Midwives*, to determine whether he was a *Man* or a *Woman*. They, upon discovery, judged him to be a *woman*; and thereupon he was enjoined to habit himselfe like one of that sex. He notwithstanding was in the mean time accused of soliciting women, and playing the *mans part*. And at last he had a *penis* issuing out of its hidden *prepuce*, (as out of a *womans* secrets) which executed the *mans office*.

I my

I my self once saw a mans *penis* so shrunk up (excepting onely when it was provoked) that nothing appeared in the wrinkled *prepuce* above the *scrotum*, but the meer extremity of the *Glands*.

In a *Horse*, and some other creatures, the vast dimension of that part is shut forth from *within*. In a *Mole* also, that little *Animal*, there is a great retraction of the *penis* into the *skin* and *muscles* of the *Abdomen*; and his *female* also hath a longer and deeper *Matrix* then is usual.

I conceive, it is with a *Cock*, who hath no *penis*, as it is with the lesser sort of *Birds*; which quickly conclude their acts of *coition*, and do perform them by *affrication* onely. For the *Orifices* of the *Privities* (of the *Cock* and *Hen*) by often conjunction, as by repeated salutes, do celebrate *coition*, not by one continued *injection*, (which *orifices* being turned outward, do protuberate, wax stiffe, and stretch after the manner of a *Glaus*; especially that of the *Cock*, which onely doth outwardly press upon the *female*, and, as I suppose, doth not enter in.

In the *Coition* of *Horses*, *Dogs*, and *Cats*, and other creatures, when the *male* presenteth his *penis*, the *female* proportioneth her parts stiffe, and extended. And *Birds* also that are tame, suffer themselves to be gently stroked, and swelling with *Veneral* appetite, expose that *Orifice*, which you may by your finger perceive to be hardened and resisting. Nay sometimes birds are so lustfull, that if you only gently smooth their backs, they will instantly incline, and extend and make bare their *Uterine Orifice*; which if your finger softly comply with, they will declare their accepted recreation, in extravagant murmurs, and flutterings of their *wings*. And that the *females* will even thence

conceive eggs, both *Aristotle* beareth witness, and I my self have found in a *Thrush*, a *Black-bird*, and others: and this experiment I gained long since, and by chance, but at my own cost. For my wife had an excellent, & a well instructed *Parrat*, which was long her delight; which was now grown so familiar, that he was permitted to walk at liberty through the whole house: where he missed his *Mistresse*, he would search her out, and when he had found her, he would court her with a cheerful *congratulation*. If she had called him, he would make *answer*, and flying to her, he would grasp her garments with his *claws*, and *bill*, till by degrees he had scaled her *shoulder*; whence he descending by her *arm*, did constantly seat himself upon her hand. If she bad him talk, or sing, were it *night*, and never so *darke*, he would obey her. Many times when he was *sportive* and *wanton*, he would sit in her lap, where he loved to have her scratch his *head*, and stroke his *back*, and then testify his contentment, by kinde *mutterings*, and *shaking* of his *wings*. I still interpreted all this to proceed from his customary familiarity and *obsequiousness*, for I alwaies thought him to be a *Cock-Parrat*, by his notable excellence in *singing* and *talking*. For amongst *Birds*, the *females* seldom sing, or provoke to *discourte*; but the *males* onely charm the *females* by the pleasant musick of their voice, and allure them to pay their homage to *Venus*. And therefore *Aristotle* saith, If *Partridge-hennes* stand over against the *cocks*, and the winde blow from whence the *cocks* are, they conceive and grow big, and for the most part, they teem even by the voice of the *cock*, if they be at that time *wanton* and *lustfull*: and this also may fall out from the *cocks* flying over them; namely if the *cock* do transmit a fructifying spirit into the *Hen*.  
And

*Hist. an. l.*  
*5. c. 5. and*  
*l. 6. c. 2.*



EXER.V. of the Uterus of the Henne.

25

And this happens chiefly in the Spring-time;  
whence the Poet :

Virgil.2.  
Georg.

*Vere tument terra, & genitalia semina poscunt.  
Tum Pater Omnipotens facundis imbribus ether.  
Conjugia in gremium late descendit, & omnes  
Magnus alit, magno commistus corpore, factus.  
Avia tum resonant avibus virgulta sonoris,  
Et Venerem certis repetunt armenta diebus.*

Earth swells in Spring, and fertile seed requires,  
Descending Æther with her vote conspires;  
And fruitful showers cheer his glad comforts hart,  
Which do to all her Issues growth impart.  
The Desert woods are then the shrill Birds Quire,  
And all Beasts are inflam'd with Venus fire.

But not long after these kinde dalliances, the Par-  
rat, which had lived many years sound and heal-  
thy, grew sick, and being much oppressed by ma-  
ny convulsive motions, did at length deposite his  
much lamented spirit in his Mistresses bosom, where  
he had so often sported. When dissecting his car-  
case, (to finde out the cause of his death) I found  
in the womb an egge almost completed, but, for  
want of a Cocke, corrupted. Which many times  
befalleth those Birds, that are immured in Cages,  
when they covet the society of the Cock.

By this and other examples, I am induced to  
believe, that the Dunghill-Cock, and the Cock-Phea-  
sant, doe not onely delight their Hennes by their  
voices, but also do confer something by those very  
voices to the conception of the egges: for even at  
night, some of the Hens at roost with him, do be-  
stirre themselves at the Cocks crowing, shaking their  
heads and wings; as if possessed by a gentle hor-  
rour, their senses were ravished as after Coition.

A certain Fowle, as big again as a Swan, was not  
long

Ornith. lib.  
20. p. 541.

long since brought into *Holland* out of *Java*, an *Island* of the *East-Indies*, which fowle the *Dutchmen* called a *Cassoware*: the figure of this fowle *Al-drovandus* representeth, and saith, that the *Indians* call it *Eme*: it is not cloven-footed, as the *Ostrich*, but hath three claws on every foot; one of which is armed with so long, so hard, and so strong a spur, that it will easily pierce through an *Inch-board*. Now its manner of smiting is forward; its body, legs, and thighs, are like an *Ostriches*, but it hath not a broad bill, as the *Ostrich* hath, but a round and black one. Instead of a crest, it hath upon the head a round extuberant horn; it hath no tongue at all; eateth any thing without distinction, be it stones, or coales, and those red-hot too, likewise pieces of glass; it hath two feathers springing out from every quill, and those black, short, and thicke, approaching to the nature of hair, or down; it hath very litle wings, and imperfect; it is a creature of a horrid aspect, and hath long red and blew gills hanging down the neck (like a *Turkey-Cock*.)

This fowle continued in *Holland* above seven yeares, and afterwards *Maurice*, the most *Illustrious Prince of Orange* sent it, with other things, for a Present to *King James*, in whose gardens it lived above five yeares: but afterward, when two *Ostriches*, *Cock* and *Hen*, chanced to be kept in the same place, and the *Cassoware* oftentimes over-heard them at the act of coition, being but in the next pennes (where they were fed apart) She unexpectedly conceived egges (stirred up, as I suppose, by a certain sympathy, from those that were something of the same kin and lineage with her) yet all that saw her, did conjecture she was rather a *Cock*, then a *Henne*, considering her weapons and martiall provisions. One of these egges she laid whole and entire,

EXER. V. tire, which had a v. gether v. annen empunct. withe the peck; the called co. off) iuc. This egg but every out all q. impruistly at the last preface to *Arizon* dye, unless after: an and correct which can merly obli. Mult B. they are, sometimes feeding, or very seldom at all, with fall in. But the egges, but yet subse. of the insect resses) do conjunction are all added thing for



EXER.V. of the Uterus of the Henne.

27

tire, which I opened and found it *compleat* ; for it had a *white* embracing the *yolk* round about, together with the *chalazæ*, or *specks* like *bailestones* annexed on both sides, and also a little *cavity* or *emptiness* in the obtuse end of it : there was likewise the *cicatricula*, the little *cicatrice*, or *whitish speck* ; the *shell* was thick, hard, and strong, which I caused to be made into a *cup* (the top being taken off) such as is usually made of the *Ostriches* egge. This egg was something less then an *Ostriches* egg, but every way perfect, as I said before ; yet without all question it was but a *subventaneous* and an *unfruitfull* one, by reason of the want of a *Cock*. But at the same time as she brought forth the *egge*, I did presage she her self would die ; and that according to *Aristotle*, who saith, *That Birds will be sick and dye, unless they bring forth*, which fell out not long after : and dissecting her, I found an imperfect and corrupt *egge* in the *Upper end* of her *Uterus*, which caused her untimely death, (as I had formerly observed in the *Parrat* and other *Birds*.)

Gen. an. 1.3

Most *Birds*, by how much the more *salacious* they are, so much the more *fruitfull* are they ; and sometimes doe without a *Cock* (either from high feeding, or some other cause) conceive *eggs*, which very seldom are either perfected, or brought forth at all, without the use of a *Cock* ; but they thence fall into desperate diseases, and at length dye.

But the *Dunghill-henne* doth not onely conceive *egges*, but *lay* them also ; and those perfect too, but yet *subventaneous* and *barren* ones. So also many of the *Insects* (in whose list are *Silk-worms* and *Butterflies*) do both conceive, and lay *egges*, without conjunction with the *male*, (as fishes also) but they are all *addle*, and *wind-eggs*. As if it were the same thing for these creatures to be with *egge*, as for

virgins



virgins to have their wombs grow warm, their termes flow, their breasts increase, and (in a word) to become marriageable; which if they be too long detained from, they are assaulted with dangerous symptoms; (namely hysterical affections, or furor Venerinus) or else fall into the green sickness, and severall other distempers. For all Creatures, when they are love-struck, grow extravagant, and if debarred of enjoyment, do at length recede much from their usual temper. Hence some women grow frantick for love; and this extravagancy is so outrageous in some, that they seem bewitched, planet-strucke, or possessed. And this inconvenience would be frequent, did not pious education, respect to their reputation, and in-bred modesty, temper and assuage these inordinate commotions of the minde.

### Of the Privities of a Henne.

#### EXER. VI.

FROM the exterior uterine orifice, is the passage to the inner parts, and matrix, in which the eggs are perfected: and this passage in other creatures is termed *vagina uteri*, or *vulva*, into which the males penis is transmitted to the matrix. But in a Hen, this passage is so perplexed, and so wrinkled and folded, by reason of the laxity of its inward coat, that though there be an easie passage from the matrix outward, insomuch that a very great egge can come forth without any great difficulty; yet that the masculine penis should get in, and that the seed should finde admission into the inner cavity

EXER. VI. Of the Privities of a Henne.

29

vity of the Uterus, is scarce probable: for I could not trace a way inward, with either *probe*, or *bristle*, nor could *Fabricius* neither; nay, if you will credit his testimony, the very *aire* cannot be blown into the *womb*: which, I suppose, was the cause why he, describing the history of the *Egge*, proceedeth from the *interiour* to the *exteriour* parts: And also considering this *fabricke* of the *womb*, he denyeth the seed to attain so farre as the *cavity* of the *womb*, or to constitute any part of the *egge*: of which opinion I willingly profess my selfe. For you shall finde nothing at all in a fertile *egge*, either added, or altered, (which is not in an *addle* one) to give any suspicion of the entrance of the *Cockes* seed into the *womb* or *egge*. But yet though all the *egges* are, without the accession of the *Cock*, *subventaneous* and *addle*; yet by his assistance (even for a good while after his treading) the subsequent *egges*, of which there is yet no *principle*, or *matter* out of which they can be made, become fertile. *Fabricius*, that he may expresse after what manner the seed of the *Cock* maketh the *egges* fertile, hath these words: *Since no seed at all appeareth in the egge, and yet it is cast by the cock into the womb, it may be demanded, to what purpose the cocks seed is cast into the womb, if it pass not into the egge?* as also, if the seed be not in the *egge*, how can the *egge* be made fertile by that seed which is not in it? My opinion is, that the seed of the cocke injected into the beginning of the *womb*, doth make the whole *womb*, and also all the yolks that come into it, and lastly, the whole *egge*, fertile; and that it doth this by its vertue, or spiritual irradiating substance; after the same manner, as we perceive other creatures become fertile, by the testicles, and seed: for if any man consider that incredible transmutation, which doth seize upon a creature

that

that is gelded, by which it looseth its heat, vigour, and fecundity in the whole body; he will easily consent, that what we say, may well befall the single womb of a Hen. But that it is most true, that the power of rendering all the egges fertile, together with the womb it self, proceedeth wholly from the seed of the Cocke, appeareth, even from the practice of women, which having a Hen without a Cock, commit her for a day or two to a neighbours Cock: and from this small commerce, all the eggs are endowed with fertility, for all that year. And this is also confirmed by Aristotle, who is of opinion, that after birds have once had the advantage of coition, almost all the egges they lay afterward are fertile. Now, lest the vertue of making fertile, which is contained in the seed, should by any means exhale or evaporate, but that it may remaine long in the womb, and so be imparted to the whole; nature hath concluded, and treasured it up as it were in a purse, in the cavity neer the fundament, which is annexed to the womb, to which there is onely an entrance, but no retreat, so that the seed being there long detained, its vertue may be the better preserved, and communicated to the whole womb.

But I did doubt the verity of the foresaid experiment, and that the rather, because I perceived the Philosophers words were falsly recited; for, hee doth not say, that, Birds, when they once have had the advantage of coition, almost all the egges they lay are fertile, but, they lay almost all their egges: where the word Fertile is superadded by Fabricius: for it is one thing, to say, that Birds are with egge after coition; and another thing, to say, that those egges are made fertile by coition. And this is more manifest by Aristotles precedent words, where he saith, In Birds, not so much as those very egges which are begotten by coition, can for the most part gain their just growth,

de Gen. an.  
l. 3. c. 1.

pag. 38.



## EXER. VI. Of the Privities of a Henne.

31

growth, unless that coition be continued. And the reason is, because, that as in women by coition with the male, the menstruous excrement is drawn forth (for the womb being warmed draweth the moisture, and the pores are opened) so it falls out in birds, whilst the menstruous excrement cometh by little and little, which cannot get out, because it is but little, and is contained above about the diaphragma, but slideth down into the womb it self. For with this the egge is nourished, as the foetus of viviparous creatures is nourished with that which comes in at the Navel. For after birds have once been at tread, they still persist to have almost all their eggs, but yet small ones, and imperfect; and therefore barren: for the perfection of an egge, is its fecundity. If therefore without continued coition, not so much as those very eggs which are conceived by that coition, do attain their Growth, or (as Fabricius interpreteth it) their Perfection; much less can those egges be fertile, which the Birds persist to lay, without coition.

But let no man think that these words (namely, the womb being warmed draweth, and the pores are opened) do any way conclude, that the womb can draw the seed of the Cocke into its cavity; for we must take notice, that the Philosopher doth not say, that the womb draweth the seed from without, but, that in women, the menstruous blood is drawn out of their own bodies, the veines and passages being opened by the heat caused by coition; and so likewise in Birds, that the blood is drawn to the womb, it being warmed by repeated coition, and that the eggs do thence encrease; as the fetus of viviparous creatures do by the Navel. But what he adjoineth concerning that cavity or purse, in which he fancyeth that the seed is entertained, even for a whole year together, is confuted by us formerly; where  
we

we affirm, that no seed at all is contained in it, and that both henns and cocks indifferently have that cavity.

Wherefore, though I easily believe (if by fertility we understand an encrease of more and fairer eggs) that poor womens henns (whose poultry probably wanteth good feeding) will lay lesser and fewer egges, except they have resort to a cock (according to that of the Philosopher, namely, If they once mixe with a cocke, then they continue to have fairer, better, and more egges, for the whole ensuing year; to which end also, plenty and wholesomeness of feeding do very much conduce) yet that henns, by some few acts of coition with a cock, should lay all fertile egges for a whole year together; that, I say, seemeth to me improbable. For if a few acts of coition were of force to so lasting a generation, Nature (which maketh nothing in vain) would have made the male birds less salacious then they are: nor would the cocke so often in one day invite his henns to Venerie, nay sometimes force a rape upon them.

Wee all know, how the henne, so soon as she forsaketh the nest where she hath layed her egge, crieth out with a shrill voice, and enticeth the cock to coition; who also replying with a loud and divided tone, carefully seeketh her out, and having found her, instantly ascendeth: which surely Nature had never permitted, but for procreation sake.

A Cock-Pheasant, penned up in an aviary, boileth with such scorching lust, that unless he have severall henns with him, (six at the least) he will extremely afflict them with repeated Coitions, and rather retard their fertility, then promote it. I once saw a Pheasant-henne, so spent and worn out

EXER.  
by the co  
could no  
cedment  
quent  
the expi  
found no  
served lik  
journe  
bounded  
a young  
with his  
nearin  
A dw  
duel, dot  
lines of  
So like  
that they  
ings; (as  
them of co  
permolt  
other ar  
in this ran  
And the  
cutions ce  
should stor  
egges for a  
And ye  
patronage  
discovery  
fall, and u  
henns from  
in that time  
pulsical as  
another hen  
paration la  
twentyeth,

by the cocke who was shut up with her (whom she could no wayes escape, neither by flight, nor concealment) that her back was grown bald by his frequent ascents, untill at last, in miserable torture, she expired for grief. Yet, when I cut her up, I found not the least rudiment of an egge. I have observed likewise a Gander, who wanting a mate, so-journed with the hennes, where his lust was so unbounded, that for some hours together he pursued a young pullet whithersoever she fled, arresting her with his bill, till at length he triumphed upon her weariness, and subdued her to a Rape.

A dunghill-cocke having gotten the mastery in the duel, doth sate his desires not only upon the concubines of his foe, but upon the conquered himself.

So likewise some females are so prone to Venerie, that they will chastise their males with their biteings; (as if they meant to whisper and advise them of conjugal delights) sometimes getting up-  
permost themselves, endeavouring by these and other arts to entice them to their recreation: and in this rank are pigeons, and sparrows.

And therefore it seems not so likely, that a few coitions celebrated in the beginning of the yeare, should store up fecundity enough, to endow all the egges for a twelve-moneth following.

And yet once (that Fabricius may have some patronage) in the Spring time (attempting some discovery of the time wherein coition is most successfull, and the necessity thereof) I did separate two hennes from the cocke for foure dayes space, which in that time laid three egges a piece, which were as prolificall as the rest. And I did after that immure another henne, which on the tenth day of her se-  
paration laid an egge, and another egge on the twentieth, and both were fruitfull: so that it may

D

seem



seem possible, that one or two *aēs* of conjunction may fructifie the whole cluster, and consequently all the eggēs of that year.

I shall tell you likewise, what I farther observed at that time; when I restored the two *hennes* (which I had formerly divorced) to the *cocke* again, whereof one of them was now big with egg, the other had newly *laid*; the *cock* ran instantly to the *latter*, and enjoyed her greedily three or four times: about the *former*, he circuited often, and by trailing his *wings* at her feet, seemed to greet her kindly, and congratulate her return; yet presently retired to the *other*, and repeated his lust again, and again, committing violence upon her *refusal*; neglecting in the mean time the *henn* that was with *egge*, using no sollicitation nor request. Truly I admired, by what significations he could be inspired to know, that *coition* could be *usefull* to the *one*, and *unseasonable* to the *other*. It is not easie to say, how males will either by the *eye*, *ear*, or *smell*, distinguish (even from farre) which *females* are ripe for their turne, and desirous of their company. Some, though they onely hear their *voice*, or sent their *urine*, or *foot-steps* only on the ground, are presently heightned, and pursue them to a compliance. But of this elsewhere, in our tract of the *Love*, *Lust*, and *aēt* of *Generation of Animals*, we shall treat at large. Wee returne to our purpose.

Of the Belly of a Henne, and  
other Birds.

## EXERCIT. VII.

FROM the outward Orifice through the privy parts, we arrive at the *Uterus* or *matrix* of the Henne, wherein the egge is perfected, encompassed by the *white*, and covered with the *shell*; but before we speak any thing of its *scituation*, and *position*, something must be premised, concerning the peculiar *anatomy* of the Belly of Birds. For I have observed the *stomacks*, *guts*, and other *entrals* of Feathered creatures, to be otherwise seated and constituted in their lower belly, then of other creatures that go upon the ground.

All kindes of Birds, almost, have a twofold stomach, whereof one is the *Ingluvies*, the other the *Ventriculus*, properly so called: in the former they treasure up their *meat*, and prepare it; in the latter, they digest it, and concoct it into the *chyle*: the first, we call the *crop* or *craw*; the latter, the *Gisard*. Birds reserve in their *craw* the whole grains which they ingorge, and from thence transmit them into the *gisard*, moistened, macerated, and softened by the water which they imbibe, that it may there be grinded, and concocted. And for that purpose, almost all sorts of Fowle swallow down *sands*, *stones*, & other harder bodies, & reserve them in their *gisard* with their *meat*; (when no such thing is to be seen in their *craw*) and this *gisard* of theirs is compacted of two exceeding thick & strong muscles, (which in lesser Birds are composed of flesh or ligaments) that with these two, as it

were with two *Grind-stones*, fastned together with two *hinges*, they may grind and mould their food; whilst the *stones* supply the place of *teeth*, of which they are destitute. By this means they digest and chylifie their meat, and afterward by *compression* (as we strain a *juice* or a *pultis* out of *herbes* or *fruits* bruised) the softer and more liquid part lyeth uppermost; and that they conveigh into the beginning of the *guts* (which in them is just at the entrance into the *gullet*, seated above the *gisard*. Now that this is so, appears in several sorts of *Birds*, in whose *gisard*, if *gravel*, or any other harder and rugged *bodies* continue any time, they receive so much impaire and smoothness from the continual *attrition*, that at last they grow useles, and so are ejected. And for this cause *Birds* exercise their *tongues* in the choice of their *pibbles*, and if they discover that they are not rough, they presently refuse them. By this means I have found *Iron*, *Silver*, and *Stones*, almost worn away and consumed in the *gisard* of an *Ostrich*, and the *Cassiope*; which gives occasion to the popular *perswasion*, that they digest *Iron*, and are nourished by it.

In *Falcons*, *Eagles*, and other *Birds of Prey*, if you bring your *ear* near, when their *gisard* is empty, you shall evidently discover the noise of *stones* collected in it, grating one against another. For *Hawkes* doe not swallow *pibbles* to coole and allay their heat, (as the common sort of *Falconers* dream) but to grinde their meat: as also other *Birds* (whose *gisard* is made fleshy on purpose to mould their meat) for the same intent, do ingorge *pibbles*, or *sand*, or such like *bodies*.

The *gisard* of *Birds* therefore, is seated within the capacity of the *Abdomen*, beneath the *Heart*,  
Lungs,



*Lungs*, and *Liver*; but the *crop* sticketh (for the most part) as it were out of the *body*, in the *lower part of the necke*, at the *Os Jugale*: in which (as I have said) their meat is onely *mollified*, and *prepared*: and from it some *Birds* return their meat macerated to their *chickens*, and nurse them up (at the same rate as *four-footed beasts* doe their's with *milke*) as you may observe in all sorts of *Pigeons*, and also in the *Spermologi*, which we call *Rooks*. And *Bees* also, when they are returned to their *Hives*, do refund the *hony* which they gather from the *flowers*, and have digested in their *stomack*, into their *proper cels*: and so do *Hornets* and *Wasps* nourish their off-spring. And a *Bitch* hath been seen to disgorge the meat which she had swallowed before, and half concocted, to supply her *whelps*. Wherefore, the wonder is less, when we see poore *beggar-women*, when their *milk* faileth them, to feed their *Infants* with *scraps*, which their owne teeth have first prepared, and reduced into a kinde of *pap*.

The *Guts* in *Birds* arise (as is said) from the upper part of the *Gisard*, and are replicated up and down in *Longitude* (not *transversly*, as in *us*.) And next to them, just under the *heart*, about the middle of the *body*, where the *diaphragma* (which is wanting in *Birds*) is seated in *Beasts*, is their *Liver*, which is very large, and divided into two *lobes*, (for they have no *spleen* neither) placed on either *side*, and fills the *hypochondria*: below the *Liver* is the *gisard* put, under which lye the replications of the *intestines*, having very many slender membranes interposed, which are filled with air: for into these (as we have said) the rough arteries of the *lungs* descend with open mouth. The *kidnies* (which are large in *Birds*) being of an *oblong* fi-

gure, composed as it were of gobbets of flesh, having no cavities at all, doe lye on both sides of the Spine, and great descending vein and Arterie, and are buried in the spacious oblong cavity of the buckle bones or sides-men. From the fore-part of the kidneys are the Ureters extended in Longitude, even to the common sinke, and fundament it self: that so the serous excrement may from the Reines be waisted thither. Now Birds have very litle of this serum, because they are small drinkers, and some of them (as the Eagle for one) drink not all. Nor doth their urine flow apart by its self; but, as we have said, doth distill from the Ureters into the common receptacle, which is allowed also to entertain the excrement of the guts, whose discharge is by this means the better provided for. The urine of Birds differeth from that of other creatures; for the parts of their urine are two-fold, one more serous, and liquid, the other more gross and thicke, which in men in health we call the hypostasis, and when the urine is now cold, it sinketh down to the bottom: now Birds (clean contrary to other viviparous Animals) have greater store of this thick sediment; which is distinguished from the other part of the urine, by its white or silver-like complexion, and it is not only discernable in the cloaca or sinke, (where it much aboundeth) and giveth a tincture to the excrements of the guts; but in the whole conduct of the Ureters, which are distinguished from the coats of the kidneys, by this very white excrement. Nor is the thicker substance which descendeth from the Reines, only visible in Birds, but in Serpents also, and other oviparous creatures; especially those whose egge is guarded by a harder kinde of shell. And they have much more abundance of this, then of the thinner

ner serous part : and it hath a middle consistence between a *thicker kinde of urine*, and the *excrement of the guts* ; so that as it passeth through the *Ureters*, it resembleth *milk coagulated*, or something thickened, and presently upon ejection it congealeth into a *crust* that is friable.

*Of the scituation and fabrick of  
the rest of the parts of the  
Womb in a Hen.*

EXERCIT. VIII.

**B**etween the *Gisard*, and the *Liver*, at the *Spine of the backe*, where in men and other animals the *Pancreas* lyeth, between the *vena Porta*, and descending trunck of *vena Cava*, at the beginning of the *Emulgent veines*, and the *preparing spermatical vessells*, where the *Celiacal artery* goeth into the *Mesentery*, there also in a *Henne* and other *Birds*, is the *Ovary*, and cluster of *yolkes bred*, which hath Before it the *Trunk of the Vena Porta*, the *gullet*, and the *mouth of the Gisard* ; and Behinde it, the *Hollow vein*, and the *Great Artery* descending by the *Spine of the backe* ; Above it lyeth the *Liver*, Under it the *Gisard*. And therefore the *Infundibulum*, which is constituted of a very thin membrane, descendeth down-ward from the *Ovary*, all along the *back*, between it and the *Gisard*. And from the *Infundibulum* or *Tunnel* (between the *Gisard*, *Guts*, *Reines*, and *Loynes*) the *Protest* of the *Uterus*, or its *superiour part*, having many *revolu-*



tions and cells (like the Colon & right-gut in a man) descendeth into the *Womb* it self. But the *Womb* it selfe, which is continuous to this *Process*, is seated below the *Gisard* at the *Fundament*, at the lower end of the *Abdomen*, between the loynes, *kidnies*, and *right-gut*: so that when the *egge* now cloathed with the *White* is contained in it, it presseth down so low, that you may easily perceive by your finger, whether it be soft, or hard, and ready to be layed.

This *Womb*, in a *Hen*, is of different magnitude and fabrick: For in a *Henne* which is big with *egge*, or hath lately layed, it differeth very much from the *womb* of a *Virgin-henne*, or *Pullet*; for her *womb* is fleshy and round, lik an empty purse; smooth without, within rough, having certain folds and revolutions according to its *longitude*: at first sight, you would conceive it to be a larger kinde of bladder of *Urine*, or a second lesser *gisard*. But in a teeming *Hen*, and one ripe for the *cocke* (which our housewives distinguish by the redness of their crest, or comb) the *Uterus* is of much better growth, and more *carnous*, having larger folds, and thicker, and of that extent, that it may conveniently receive an *egge*. And this *womb* is extended and passeth upward a good way, along the *Spine* of the back, and is made up of many complications and cells; (as the *Collick-gut* is) which several cells are composed of the replications of the *womb* it selfe. The Bottom hereof, as it is the largest, so it is the thickest, and most *carnous* part of all, fortified with more and greater foldings then the rest, whose figure within is *Ovale*, as if it were the Mould to cast *eeges* in. I call the *Ascending* part, or production of the *Womb*, a *Process*: *Fabricius* calleth it, the second *Uterus*, and saith it consists of three rundells

Ex.VIII. of the parts of the Uterus of a Hen. 41

or turnings : *Ulysses Aldrovandus* calleth it the stomach of the womb : there are, I confesse, most commonly three spires or rundels, yet this is not so constant, but that nature fashions it otherwise, for varietie, (as she doth sometimes in the circungrations of the Colon.

This womb, the higher it goeth, the slenderer and sparer it groweth by degrees, and hath fewer and lesser circunvolutions, till at length as it were dissolving into very thin membranes, it becomes to be the *Infundibulum*, which arising up as farre as the diaphragme, encompasseth all the Ovary.

And therefore *Fabricius* divideth his second womb into three parts; viz. the beginning, the middle, and the end. The beginning, saith he, degenerating into a slender and most soft membrane, frameth a wide orifice, representing as it were a little pipe or tunnel. The middle part (which I call the Proceß of the Uterus) is constituted of three transverse spires or Rundels, and serveth to furnish the yolk of the egge with a white, and extendeth it self to the lowest and most capacious place or part of all; which he calls the End of that Uterus, wherein (saith he) the Chalazæ, or specks, and the two membranes and shell are formed.

The whole substance of the Uterus (especially about the folds) as well in the Uterus it selfe, as in its Proceß, is embroydered with many large veines, and yet there are more divarications of Arteries then of Veines.

The Folds which in the inside of the womb are oblique and transverse, are of a fleshy substance, and look exceeding white and milkey, breathing forth a kinde of stiffe moisture; so that the inward superficies both of the Uterus, and also of its Proceß, is lined as it were with very much, and thinne whites of egges; by which meanes the descending yolk gaines

gaines greater bulk, and cloatheth it self in white by degrees, till it arrive at full perfection.

You shall seldom finde the *Uterus* unfurnished of eggs, but that there are some still. either sticking in the revolutions of the *Process* of the womb, or else contained in the *Uterus* or womb it selfe. If you blow up this *Process* when it is empty, it will appear like a litle oblique distorted pipe, rising up sharp at the end in manner of a *snails shell*, or a *Top*. And the Fabrick of the womb is like that which wee lately observed in the *privy parts*; namely, that though there be open way enough to receive the egge in its descent, yet there is scarce any return to be obtained upwards again, (even for the air it self, though backed by inflation.)

The *Process* of the *Uterus*, together with the *spires*, is so diminished in a *Hen* past laying (as we have said) and also in young *pullets*, that it resolveth into most thin *membranes*, and is quite abolished, and leaveth no appearance of it, as neither of the *Ovary*, or *Infundibulum*; only there remains (like the root of the cluster) a glandulous and spongy substance, which tasteth pretty sweet in a boyled *Hen*; as in *Viviparous* creatures (especially if they be young and tender) the *Pancreas*, and *Thymus* doe; which therefore the people call the *Sweet-Breads*.

The *Womb*, together with its *Process*, is by the helpe of a membrane fastned to the back: which membrane *Fabricius* doth therefore call *Mesometrium*; because, the second womb, together with this membranous body, wherein many veines are divaricated, may fitly be compared to the *Intestines*, and their *Mesentery*. For as the *Mesentery* keepeth firm the *Guts*, so doth that *Mesometrium* fasten this long *Process* from the chine, lest being dislocated, and involved,



VIII.  
in white  
crushed  
sticking  
mb, or  
se. If  
it will  
sing up  
ell, or a  
ke that  
parts;  
mough  
se scarce  
(even  
n.)  
th the  
(as we  
resol-  
ce abo-  
neither  
remains  
spongy  
a boyed  
ally it  
d Toy  
all the  
by the  
which  
lesome-  
th this  
arica-  
d then  
ma the  
is long  
and in-  
olved,

Ex.VIII. of the parts of the Uterus of a Hen.

olved, it should disturb and obstruct the passage of the yolks, whereas now being free and open, it entertaineth them gently. Through this Mesometrium, many vessels stored with blood, are branched into every replication of the womb. And therefore it beareth much analogy to the Mesentery, both in its beginning, substance, fabrick, use, and office. There is also a Ligament (like a fillet) extended long-ways from the bottom of the womb to the Infundibulum, such a one as we may see produced in the upper region of the Colon; which is as it were a portion or fragment of the outward coat, going along and contracted, that the rest of the Process might by its help be wrinckled into folds and replications. Thus, if you cut off a gut, and put in a thred into it all along the whole length of one side of it, and then tie it hard, the other opposite side will curle up into wrinckled complications and windings.

This then is the Constitution of the womb of a Henne that layeth egges; namely, fleshy, large, durable and extensive into length and breadth, full of windings, spires, and convolutions all along the spine of the back from the fundament, upwards, and continuous to the Infundibulum.

of

## Of the generation of the Egge.

## EXERCIT. IX.

**T**He yolk, in the cluster, is onely a litle wheal or push, and growing by degrees, attained the complexion and bulk of a yolk; and falling off from the cluster, it descendeth through the *Infundibulum*; and rowling through the *Spires* and caverues of the *Proceß* of the womb, doth cloath it selfe all over with the *White*: though (as *Fabricius* rightly observed against *Aristotle*) it doth adhere to the womb no where at all, nor is it nourished by any *Umbilical vessels*: but as the egges of frogs or fishes, provide themselves whites out of the waters wherein they lie; or as beanes, pease, and other pulse and graine, being moistened, do swell, and thence acquire aliment to the blossoms which spring from them: So in like manner out of the aforesaid foulds of the womb, an albugineous humidity issuing thence (as it were out of a dugges, or *Uterine cake*) the Yolk (by vertue of a vegetative heat, and faculty wherewith it is endowed) findeth out, and concocteth its white. And therefore in those foulds, and in the cavity of the *Uterus*, a liquor, in tast much like the white of an egge, doth most plenteously abound. And in this sort the yolk descending by little and little, is invested with a white, until at last, assuming membranes, and a harder shell in the extremity of the womb, he is compleated for his Exit.

Of the Growth and departure of the  
Egge from the Womb.

## EXER. X.

**A**ttend Fabricius: as we pronounce (saith he) pag. 8.  
 the action of the Stomack to be Chylification: and  
 the action of the Testicles to be the Generation of  
 Seed; because we find chyle in the Stomack, and  
 Seed in the Testicles: So we confidently affirm the  
 Action of the Birds womb, to be the Generation of egges,  
 because there we finde the eggs. But this is not the on-  
 ly Function of the womb, but the Augmentation of the  
 egge also, which succeedeth immediately after the  
 Generation, till the egge be perfected, and purchase  
 a just enlargement, is implied. For the Henne doth  
 not naturally lay her egge, before it be compleat, and  
 have attained a convenient magnitude. The Action  
 therefore of the Uterus is both the Generation, and  
 Augmentation of the egge: Now Augmentation sup-  
 poseth Nutrition, and includeth it. But since all  
 Generation proceedeth from two Principles; namely,  
 the Efficient, and the Subject Matter: The Efficient  
 in the procreation of egges is nothing else, but the In-  
 struments, or proposed organs, namely, the twofold  
 Uterus: and the Subject Matter, is nothing but  
 Blood.

But we, for Brevity sake (omitting, as is meet,  
 all controverſie) as we do easily allow, that the use  
 and office of the womb, is to procreate egges: so  
 we pronounce the Adequate Efficient (as they call  
 it) to be contained in the egge it selfe: and wee  
 do conceive that both the Generation, and Aug-  
 mentation of the Egge, proceedeth not from the  
 womb



womb, but from an innate natural principle of its own : And that this Principle doth flow first from the whole Henne, into the Yolk while it yet is only a rudiment, or first wheale as it were; which afterwards like a congenial heat, or Efficient Nature) inherent in the Yolk, *nurisseth* and *Augmenteth* it : As there is a certain in-bred faculty in every part of the Body, by which it is fed and augmented. As concerning the manner how the Yolk is invested with the White, Aristotle seems to have conceited it to be thus : That there is in eggs, while their membranes are yet tender, a kind of Umbilicall channel, existent in the sharper end of the eg (at which he determineth the eg to begin) by which it increaseth : which perswasion Fabricius reprehendeth, denying any being at all to any such channel; Or that the Yolk doth any where adhere to the womb : and salveth that scruple concerning that small appendix found in the egge after it is layed, saying ; The augmentation of the egge is two-fold, according to the two-fold womb, that is the superior, and inferior : and also, according to the two-fold substance, whereof the egge is compounded, that is, the Yolk and the White; the Yolk is increased by a true Augmentation; namely, by blood; which is conveyed to it by the Veins, whilest it is yet adjoynd to the Vitellary. But the White is increased, and groweth to the yolk, after another fashion : For it receiveth not nourishment by the Veins, nor by a true kind of Nutrition, as the Yolk doth but by Juxtaposition, adhering to the Yolk, while it passeth through the Second Uterus.

But in my Opinion, the Egge is augmented after the same manner (wheresoever it be) as the yolk is augmented in the cluster, viz. from an Intrinfecal concocting principle, with this distinction

de Gen. an.  
l. 3. c. 2.

pag. II.

EXER. X. of the Egge from the womb.

47

on onely, that while it is in the cluster, its aliment is conveyed to it by the vessels, but in the womb it findeth it ready for it to imbibe. For in all Nutrition and Accretion, a Juxtaposition of the parts is equally necessary, and also a Concoction and Distribution of the applied nutriment; nor can the one be thought to be lesse a True Nutrition then the other: for both of them are made by a new accession, apposition, agglutination, and transmutation of the Aliment. Nor can Beanes or Pease, which attract moisture from the Earth (which they suck in like sponges) be said to be lesse truly nourished, then if they did draw in that moisture through the Orifice of Veins: And Trees also drinking Dewes and Showres in at their Barks, are as truly nourished, as they are by their Roots. But concerning the manner of this Nutrition, we have spoken more largely in another place. At present, it remains that we encounter another difficulty; that is, whether the Yolke, while it acquireth a White, doth not make some separation, and choice in it: and so, while it is about augmenting, whether some more earthy part be not dismissed into the Yolk or middle of the egge, (as into the Center, as Aristotle would have it) and the lighter, and thinner parts be not reserved in its superficies or surface: For between the Yolk which is yet in the cluster, and that which is in the midst of the eg when it is perfected, this is the difference in chief, that though the former be yellowish in colour and appearance, yet its consistence representeth rather the VWhite; and being sodden, thickeneth like it, groweth compact, and viscus, and may be cut into slices. But the Yolk that is in the midst of a perfect egge, being boiled, groweth

groweth friable, and of a more earthy consistence, not thick and glutinous like the *White*.

## Of the Egg-shell.

### EXERCITATION XI.

**I**T is convenient, that having declared how the *pag.22.* *egge* is generated, wee should now treat of its parts, and their differences. An *Egge* is compounded (saith *Fabricius*) of a *Yolke*, a *White*, two *Chalazæ*, or specks, three membranes (namely one membrane proper to the *yolk* alone, and two other, common to the whole *egge*) and last of all, of a *Shell*. To all which, two things are to be added, which may not be truly ranged amongst the parts of the *egge*; one whereof is a certain small cavity in the blunter end of the *egge* near the top of the *Shell*; the other is a certain little white print, like a small round *Cicatrice*, affixed to the superficies of the *yolk*. The accompt of every of which we shall lay down more punctually, beginning from the outward parts. The outward Covering (which is by *Pliny* called the *Barke*, *Rind*, or *Paring*; and by *Q. Serenus*, the *Egg-shell*) is a hard, slender, friable, and porous tegment, having divers colours, namely, white, pallid, red, spotted, and sprinkled with several punctures: to wit, the *Hens*, and *Pigeons* egg-shells are white; the *Water-fowles*, pale; the *Hawkes*, or *Kastrells*, red as *Vermilion*; the *Pheasants*, spotted, and distinguished with points, as *Aristotle* noteth. All eggs have not a shell; for *Serpents* eggs have none; and some *hens* (though rarely) lay eggs without a shell.

de Hist. an.  
l.6.c.2.

This



This shell, though it be hard, is not equally hard in all parts, but is more hard about the top, and superiour part of the egge. And therefore *Fabricius* saith, It is a question, when the egg-shell is formed, and out of what subject-matter. For *Aristotle* and *Pliny* affirm, that the shell is not made within, but when the egge is laid, & as it is going out; so that the outward heat drying up the moisture, the Air condenseth & hardneth it. And this is done, as *Aristotle* supposeth, both that it may have the easier passage, and also that it may not pain the parent: As they say that an egge softened in vinegar, may be crowded into a vessel of a narrow neck.

*Fabricius* indeed was long at odds with this opinion, by reason he had found an egge with a hard shell in the belly of the Hen; an experiment which is daily proved by house-wives, whilest endeavouring to know whether the Hen be ready to lay, they grope the belly without, to try whether the shell be hard. But afterwards, when he had received from creditable women, that the egg-shell assumed its obduration from the aire in its exit, which aire doth exiccate a stiffe moisture which environeth the egge, and condenseth and fastneth it to the shell, before the shell of it self be exactly hard: and having also discovered the same by his own experience, he altered his opinion, and was perswaded, that the egge in the Uterus hath truly a shell, which shell is of a middle consistence, between soft and hard, but that it obtaineth a much greater degree of obduration presently after it is layed, by reason of a certain clammy tenacious humidity which congealeth about the shell, occasioned by the evaporation of the thin and moist parts; with which humidity the whole superficies is bedewed, which adhering to the tender shell, is dried and hardned, the cold ambient aire, conducing something thereunto. And this (saith he)

you may soon perceive, if you keep Hennes in your yard, and be dexterous and diligent to receive the eggs from them, as they lay.

This opinion of Aristotle did for a long time prevaile with me, till I discovered the contrary by infallible experience. For I take it as a measured truth, that the *Egge-shell* is most commonly hard even in the womb it self. And I once saw an egge cut out of a live Henne, which had no shell at all, but yet was throughly drenched, and begirt with a glewey moisture: and yet the egge never hardned at all. by the congelation, or evaporation of the moisture about the *Skin*, (as *Fabricius* would have it) nor was it any whit altered by the ambient cold aire, but continued the tendernesse which it had in the womb. I have also seen a *New-laid* egge, which had a compleat hard shell, over which was a case made of a cuticular soft membrane, which membrane did never congeal. Moreover I have seen an egge exactly surrounded with a Shell, save only on the very top of the acute end of the egg, where remained a smal soft rising, such a one as Aristotle perhaps conceived to be the Reliques of the Navel.

And therefore *Fabricius* seemeth to me to be in an error; for though I was never so good at sight of Hand, to surprise an egge in the very laying, and so make discovery whether it was soft or hard; yet this I confidently pronounce, that the Shell is compounded within the womb, of a substance there at hand for the purpose: and that it is framed in the same manner as the other parts of the egge are, by the *Plastick* faculty: and the rather, because I have seen an exceeding small egge, (*Fabricius* calleth it *Ovum Centeninum*, and our Women call it the *Cocks egge*) which had a

Shell

EXER. XI. Of the Egg-shell.

51

Shell of its own, and yet was contained within another egge, greater, and fairer then it, which egge also had a Shell too. And this Egge I shewed King Charles my most gracious Master, in presence of many others. And that very year, cutting up a large Limon, I found another small, but yet a perfect Limon in it, which had also a yellow rind: Which thing is now frequent in Italy, as I am informed.

It is the usual error of the *Philosophers* of these times, to seek the diversity of the *causes* of *Parts*, out of the diversity of the *matter*, from whence they should be framed. So *Physitians* affirm, that the different parts of the body are fashioned and nourished by the different *materials* of *Blood*, or *Seed*; namely the *softer parts*, as the *Flesh*, out of a thinner matter; and the *more earthy parts*, as the *Bones*, &c. out of grosse, and harder. But this error now too much received, we have confused in another Place. Nor are they lesse deceived, who make all things out of *Atomes*, as *Democritus*; or out of the *Elements*, as *Empedocles*. As if (forsooth) *Generation* were nothing in the world, but a meer Separation, or Collection, or Order of things. I do not indeed deny, but that to the Production of one thing out of another, these fore-mentioned things are requisite: But *Generation* her self is a thing quite distinct from them all. (I finde *Aristotle* in this opinion) and I my self intend to clear it anon; that out of the same *White* of the *Egge* (which all men confesse to be a *similar body*, and without diversity of *Parts*) all and every the parts of a *Chicken*, whether they be *Bones*, *Clawes*, *Feathers*, *Flesh*, or what ever else, are procreated and fed. Besides, they that argue thus, assigning onely a *Material cause*, deducing the causes of



Natural things, from a voluntary or casual concurrence of the *Elements*, or from the several disposition or contriving of *Atomes*: they do not reach that which is chiefly concerned in the Operations of Nature, and in the Generation, and Nutrition of *Animals*: namely, the *Divine Agent*, and *God of Nature*, whose operations are guided with the highest artifice, providence, and wisdom, and doe all tend to some certain end, and are all produced, for some certain Good.) But these men derogate from the honour of the Divine Architect, who hath made the *Shell* of the *Egge* with as much skill, for the *egges* defence, as any other particle; disposing the whole out of the same matter, and by one and the same formative faculty.

Now though what I have delivered is very true, (namely, that the *egge* whilst it is yet in the womb, is guarded with a hard *Shell*) yet I have still prized *Aristotles* judgement so highly, that I never would recede from his Oracles without premeditation, and therefore I do conceave (which thing also my own observations do confirm) that some accession to the induration of the *egge-shell*, doth accrew from the ambient air in its very exit: and that, that stiff and slimy moisture, (wherein it is drenched at its being laicd) doth presently after its exclusion harden. For the *Shell*, while it is yet in the womb, is much thinner, more transparent, and of a smooother superficies: But after laying, it is much thicker, lesse translucent, and of a rough Superficies (as if it were rough cast with a white powder, which had newly dried to its sides.)

And now we are upon this subject, give me leave to expatiate a while.

R.XI.  
l con-  
al dif-  
e not  
e Ope-  
s, and  
Agent,  
guided  
dome,  
are all  
e these  
Divine  
e Egge  
as any  
of the  
mative

EXER.XI. Of the Egg-shell.

53

In the *Eastern barren Islands* of *Scotland*, there is such a mighty affluence of all-moſt all ſorts of *Sea-fowle*, that if I ſhould relate all that I have heard, though from perſons of great integrity, I fear I ſhould be ſuſpected more Fabulous then thoſe ſeveral Authors, who diſcourſe of the *Scottiſh* or *Soland-Geefe*, which they ſtory to be born from the fruit of certain Trees falling into the *Sea* (which fruit or *Geefe*, themſelves never ſaw) However I ſhall venture to relate what my owne Eyes have ſeen.

There is a little *Island*, the *Scots* call it *Baſſe*, (by this, *Reader*, gueſs at the reſt of them) it is not far from the ſhore, ſeated in the *Main Sea*; ſtanding upon a rugged and dangerous Clift, (you may call it rather one great continued *Stone*, or *Rock*, then an *Island*) it is not above a mile about. The ſuperficiſ of this *Island* (in the moneths of *May* and *June*) is almoſt covered quite over with Neſts, Egges, and Young-Ones, that for their infinit abundance, you can ſcarce ſet your foot in a ſpare place, and ſuch a mighty flock hovereth over the *Island*, that (like thick clouds) they darken and obſcure the day: and ſuch a cry, and noiſe they make, that you can hardly hear thoſe that ſtand next you. If you look down into the *Sea* beneath you (as from a ſteep Tower, or *Preſciple*) you ſhall ſee it all ſpread over with ſeveral ſort of fowle, ſwimming to and fro, in purſuit of their Prey. Juſt at the rate, as ſome ditches and lakes in the Spring time, are paved with *Frogs*; and open Hills, and ſteep mountains, are ſtuck and embossed with flocks of ſheep, and Goats. If you ſaile round the *Island*, and look up into the ſeveral Clifts, and Cavernes of it, you ſhall finde them all peopled and inhabited with ſeveral co-

Ionies of Birds and Fowle, of distinct Kinde, and magnitude: more indeed, then in a clear night, when the Moon is absent, there are Starres to be discerned in the Firmament: and if you observe the severall Regiments of those that fall out, and those that flocks home wards at the same time, you would take them for an infinite swarm of Bees. It is not to be imagined what a vast yearly revenue the Lord of the Island maketh of the *Plumes*, and the Remainders of the *Nests* (which are useful for firing) together with the *Egges* which hee seetheth, and then trafficketh away: that which he himself told me, was indeed incredible. But this one thing which reflects neerer upon our discourse, seemeth to me remarkable in chief, and doth give a cleer testimony of the excessive multitude: which is, that this *Island* as you approach it, shineth with a white glasing, and the clifts resemble mountaines of the purest Chalke, though the native complexion of the Stone be obscure and black. That which thus discoloureth the *Island*, is a white crust, which is friable, and of the very same Consistence, Complexion, and Nature with the *Egge-shell*; so that all parts of the *Island* are plaistered over with this hard tegument, and crumbling or friable crust or shale. The bottome of the *Island* which the Tyde washeth every day, retaining still its natural colour, clearly sheweth that that *fucus*, or sophisticated whiteness, proceeds from the liquid Excrements of the Birds (which they discharge when they disburden their Belies) and by which, as it were with an *Egge-shell*, white, hard, and friable, the *Walls* are crufted and disguised: And after the same manner, doe *Aristotle* and *Pliny* consent, that the *Egge-shell* is formed. None of these Birds are Citizens of the place, but

Forreigners



Forreigners all, and resort thither for convenient Laying, and there they continue some weeks as in their *Inne*; till they and their Young-ones be all in condition to fly away together. But that white *Ruff-cast* is so solid, firme, and thick, that you would think it were the genuine and natural substance of the *soile*.

This liquid, white, and bright *Excrement*, doth glide with the *Urine* from the *kidnies* of the *Birds* through the *Ureters*, into the common cavity or *Jakes*, and there covering over the *excrements* of the *guts*, passeth forth together with them, and it is a thicker part of their *Urine*, then that which we call the *Sediment* or *Hypostasis* in ours. We have spoken something of this matter before, and we have demonstrated it fuller elsewhere.

Store of this white *excrement* is there chiefly to be seen, where the *Hawkes* defile the *walls* that do neighbour their *pertches* with their *ejections*, which they be-dawb with a glewy white, and distinguish as it were with a *Ceruse*.

I have found as much of this slimey cement in the repository of a dead *Ostrich*, as would fill ones *hand*: so also in a *Land-Tortoise*, and several other *Four-footed creatures*, that are *Oviparous*, this white *plastering-stuff* doth abound; and being disloaded, the thinner parts evaporating, it doth soon congeale either into a *friable crusty substance*, or into a *dust or powder*, resembling the *egg-shell*, pounded in a *Morter*.

Amongst the so many several *kindes* of *Birds* (which make their conflux to the aforesaid *Island* for *Procreation* sake) and so many several *structures* of their *nests*, wherein they hatch their young, there was one *Bird* shewed me above all the rest, which layeth one onely *egge*, fixing it upon the

*steep point of a sharp stone*, (having neither *nest*, nor any other *materials* to support it) and that so secure, and firmly, that the *mother-bird* can leave it there, and return again to it at pleasure, without any prejudice to the *egge* at all. But if this *egge* be once removed from its *station*, no art nor cunning in the world can fasten it again, but it instantly falleth into the *sea*, as from a *precipice*, without redemption. The reason is, because the place where it is mounted, is *incrusted* all over with the *white cement*; and the *egge* being newly layed, wreaketh with a *stiff* and *viscous humidity*, which presently congealing, it is agglutinated to the subjacent *stone*, as it were with a kinde of *soulder*.

An example of so nimble a *concretion* as this, we may see at the *Statuaries*, who out of *calcined Alabaster*, or certain *morter* tempered with water, doe make a liquid *cement*; which being artificially applied, will take off the *figure* of the *countenance* of a *dead man*, or the *shape* and *resemblance* of any thing whatsoever, be it never so litle; and so that growing hard, remaineth for a *Mould*.

As therefore in almost all *liquors* there is some *earthy consistence*, (as in *Wine*, there is the *Tartar*; in *Water*, *mudde* or *sand*; in *Lie*, *salt*; which when the greater part of the moisture is exhaled, doth subside, and congeal at the *bottom*) so is there a *white sediment*, descending with the *urine* from the *Birds kidneys* into the common *Jakes*, with which I did conceive the *egge* was there *incrusted*, and *plastered over*; as the pavements are by *Hawks*, and the *elists* of the fore-said *Island* by the numerous conflux of *Birds* and *Fowle*: And thus *Chamber-pots*, and places where people *urine* much, use to be over-cast with a *yellow crust*, from the

con-

concrecence of that substance, which createth stones in the *kidnies* and *bladder*, and other parts of the *Body*. I did, I say, conceive (especially being induced thereto by the authority of *Aristotle* and *Pliny*) that out of this white *kypostasis*, which doth much abound in all *Oviparous* creatures, (whose eggs are encompassed by a hard *shell*) the *fabrick* of the *Henns* egg-shell was erected, and congealed (upon *exclusion*) by the cold *ambient aire*. And this opinion is so rooted in me by many other experiments, that I can hardly forbear to believe, that some part of the *shell* at least, is produced from thence.

But (as *Fabricius* rightly adviseth) let reason be silent, where experience warranteth the contrary; for it is too much the crime of the age we live in, to obtrude opinions built upon conjecture, and slender reasoning, as infallible truths (without any testimony at all from sense.)

For I am certainly assured from Experiment, that the egge (at least here in *England*) is adorned with its *shell*, while it hath its abode in the *Womb*, though *Aristotle* and *Pliny* affirm the contrary, and *Fabricius* also is not very obstinate in the negative. Perchance indeed in hotter countries, where the *hennes* are of a stronger constitution, the *egges* are commonly layed soft, and without *shells*, but that is very rare amongst us. So when I was at *Venice*, *Aromatarius*, a famous *Physitian*, shewed mee a small leaf formed between the two *shales* of a *Pease* cod, though with us in the like case there is onely a small knob of the future pulse to be seen. So much doth the indulgent temper and clemency of the *Heavens*, *Soil*, and *Aire*, conduce to the fecundity, and happy increase of things.

Of



## Of the rest of the parts of the Egge.

## EXERCIT. XII.

**W**Here, how, and when the rest of the parts of the egge are generated, we have partly declared already in the history of the Womb; and shall partly mention hereafter, when we come to treat of their Use.

pag. 22.  
The  
White.

The *White* (saith *Fabricius*) is by *Pliny* called *Ovi albus liquor*; by *Celsus*, *Ovi candidum*; by *Palladius*, *Ovi Albôr*; by *Apicius*, *Ovi album*, and *albumentum*; in Greek, λευκόν; by *Aristotle*, λευκωμα; by *Anaxagoras*, λευκον γαλα, *Lac avium*, the Milk of the Bird. And it is the cold, stiffe, white liquor of the egge, of different thickness, (for at the obtuse and acute end of the egge it is more fluid, but more crass in other parts) and quantity (for it is in more abundance at the blunt end of the egge, and less at the sharp, and yet still less in the other parts) embracing the yolk round about.

But I have ever observed in a Hennes egge, not onely a difference in the same *White*, but two distinct *Whites* in the same egge, and both of them involved in a peculiar membrane of their own: One of which is more thin and fluid, and almost of the same consistence with that humor which we have said to flow in the folds of the Uterus, and to constitute and nourish the *White*. The other *White* is more thick and viscous, & dyed of a deeper white-colour then the other; which in stale, and such eggs as the Hen sitteth on, after some dayes of her Incubation, waxeth yellowish; and as this thicker *White* doth immediatly surround the yolk, so doth the li-

quid

Ex. XII. Of the rest of the parts of the Egge.

59

quid *White* encompasses this. Now, that these two *whites* are really distinct, will soon appear, if after you have broken and removed the shell, you prick the two *membranes* which come next to hand; for then presently this liquid and exterior *White* will runne about, and the two *membranes* sinke to the bottom of the *bason*: but the grosser *White* will all the while keep within its own bounds, and globous figure, as being terminated with its owne proper *membrane*, which yet is so subtile and slender, that your eye cannot perceive it; but if you cut it cross the *White*, it will presently stream out, and lose its round figure: as when a *bladder* is divided, the moisture contained therein is set at liberty; and so also if you make a breach upon the proper containing-coat of the yolke, the saffron-coloured juice will issue out, and its former globosity be destroyed.

The Yolke (saith *Fabricius*) is called in Latine *The Yolke* *Vitellus*, from *Vita*, Life; because the chicken liveth upon it: It is also called from its colour *Ovi Luteum*, the yellow of the Egge; in Greeke, *χρυσόν*; by *Hippocrates*, *χρῆσδν*; by *Aristotle*, *ὀχρὸν*, and *λευκόν*; the *Antients* (as *Suidas* out of *Menander*) *νεοπλόν* that is, the pullus, or chicken; because they conceived the chicken was bred of that part. It is the softest juice that is in all the egge, and confined within a most thin *membrane*, which being broken, it presently glideth forth, and is then inconstant to any figure: it is treasured up in the middle of the egge, being sometimes yellow, and sometimes of a mixed complexion, betwixt yellow and pallid; it is exactly circular; and of divers magnitude, according to the diversity of the magnitude of the Fowles themselves; for *Water-fowle* have a larger yolke, and *Land-fowle* a larger *White*, saith *Aristotle*. According to whom also, The yolk  
and

*The Yolke*  
pag. 23.

*Hist. an. l.*  
6. c. 2.

and White are of a contrary nature, not in colour only, but power; for the yolk is condensed by cold, which cold doth not condense the white, but dissolve it. And so on the contrary, the white is condensed by fire, but the yolk is not condensed thereby, but remaineth soft, unless the egge be over-rosted; being more dried and hardened by being boyled then roasted. And as in the greater world, the earth is deposited in the Center, the Air and the Water being round about it, so also the yolk, as the more earthy part, is incircled by the two whites, whereof the one is grosser, the other finer. Nay (Aristotle addeth further) if any man beat many egges together in a bason, and boyle them with a soft and gentle fire, the yolks will in their entire mass gather themselves orbicularly into the midst, and the whites surround them. Yet Physitians generallly do decree the White to be the colder part. But of that more hereafter.

Hist.an.l.  
6.c.2.  
de gen.an.  
l.3.c.1.

The Chalaza.

The Chalaza, that is, the Hail-stones, or litle pearls or specks, like Haile (which the Italians call Galladura, and wee the Treddle) are two in every egge; one seated in the obtuse, the other in the Acute Angle of the egge. The major part of both which is found in the white, but yet they adhere closer to the yolke, and are annexed to its membrane. They are something oblong bodies, more congealed, and whiter then the white it self, knotty, and in some sort transparent, as Hail is, from whence they borrow their compellation: for every Chalaza containeth several hail-stones as it were, glewed to one another by the white. One of these Chalazae is larger then his fellow, and more distant from the yolke, towards the blunt end of the egge; the other smaller, and tendeth from the yolke to the sharp end of the egge. The larger of these two is made up of three knotty substances, like haile-stones, or seed-



Ex. XII. Of the rest of the parts of the Egge. 61

seed-pearles, which are placed a small space one from the other, the lesser lying behinde the greater.

In all eggs of all Birds whatsoever, whether they be fertile, or addle, these *chalazæ* are to be found, and that in each end, one; whence the fond persuasion of old Wives, that the *chalazæ* are the Cocks seed, and the subject matter out of which the chicken is procreated, lyeth waste, and overturned. And yet *Fabricius* himself, though he absolutely deny that they are made of the seed of the Cock, yet he laboureth with many arguments, to prove, pag. 48. that they are that immediate matter, which the Cock endoweth with fecundity, and out of which the fabrick of the chicken is erected: which he endeavoureth to pag. 57. evince by this fraile ground, that (forsooth) in an egge when its boyled, the *chalazæ* are in such sort contracted and shrunk up, as that they represent a conception, or chicken shaped, and hatched. But how improbable a thing is it, that every egge should have two seeds or rudiments, for the constitution of one only chicken, when no man living ever yet beheld any foundation or progress of a chicken, but only in the blunt angle of the egge? And moreover, there is no sensible difference at all between the *chalazæ* of those eggs which coition hath made fruitful, and those which are altogether barren. But this worthy man was mistaken in the intent of the *chalazæ*, which shall appear more clearly hereafter.

In the eggs of the least Birds of all, you may track these *chalazæ*, which appear there like a fine thred, or slender nerve. But in the two ends of the eggs of the Ostrich and Cassoware, I have seen exceeding thick, long, and white *chalazæ*, consisting of many little globous bodier, of different dimension.

In

The Ca-  
vity.

In the *blunter end* of the *egge*, neer the *shell* in the inside, you may discover a litle *small cavity*, or *bulowness*; which is sometimes exactly at the *top* of all, and sometimes inclining to one *side*, almost directly opposite to the *Chalaza* which is at the other *end*: the figure of it is most commonly *circular*, but in a *goose* or *duck-egge* it is not so precisely *round*. This *cavity* you may plainly see, appearing like a *cloudy spot*, if at night you hold an *egge* against a *candle* in one *hand*, and lay the other *hand* tranversly upon the *obtruse angle* of the *egge*.

In a *new-layed* *egge* it is but litle, seeming in *magnitude* of the bigness of the *ball* of a *mans eye*; but it increaseth dayly, according as the *egge* groweth *faler*, and the *weather* hotter.

After one *dayes incubation*, it spreadeth mainly, as if some thinner part of the *white*, which lyeth uppermost, were exhaled, and the rest contracted, and so the space grown wider. For this *cavity* resideth between the *shell*, (which in that place hath no *membrane* to line it) and that outward *membrane* which containeth all the liquidities of the *egg*. All eggs whatever have it, nay, I have found it in the eggs which remain as yet in the *Uterus* of the *Henne*, so soon as ever they assume a *shell*. Some that pretend to cunning in this matter, will prognosticate, that if this *cavity* be directly in the *top* of the *egge*, the *chicken* then will be a *cocke*, but if it deflect to the *side*, it will be a *henne*. But this is most certain, if the *cavity* be very small, it signifieth the *egge* is *new-layed*, but if it be any thing large, a *fale* one. But more largely of this hereafter.

The Cica-  
trice.

There is a very small *white circle* embracing the coat of the *yolke* (in fashion of a small *Cicatrice*) which

Ex.XII. Of the rest of the parts of the Egge.

63

which *Fabricius* therefore calleth *Cicatricula*; but he setteth litle by it, counting it rather a *blemish*, then a *part* of the egge. This is a very litle *spot*, about the bigness of a small *Lentile*, like the *ball* of a *Birds eye*, being *white*, *flat*, and *round*. And all egges have this too, even from their very first *original* in the *yolk*. And therefore *Fabricius* is deceived, while he fancieth this *spot* to be nothing but a *relique* of the *stalk* broken off from the *yolk*; by which it was incorporated to the *cluster* in the *Ovary*. For the *Pedunculus* or *stalk* (as himself acknowledge) is *hollow*, and as it approacheth neerer to the *yolk*, it dilateth it self, that it may encompass it round, and shut it up as in a litle bag or purse; for it is not fastned into the middle of the *yolk* (as the *stalks* of *Apples*, and other *Fruits* are) that so it should leave a *relique* behinde it, when it falleth off. Now if sometimes in a very fair *yolk* (as *Fabricius* reporteth) you chance to finde a double *Cicatrice*, it may probably occasion a *Monster*, or *Twinn*, (as shall be discoursed hereafter) but doth no way import a double *stalk*. But he is extremely overseen, in thinking this *Cicatrice* to be utterly useles: for it is the most material, concerned part in the whole *egge*, for whose sake all the rest of the parts are created, and the *original* and *foundation* out of which the *Chicken* it self is formed. And *Parisanus* doth falsly contend, that this is the *Cocks seed*.

of



## Of the difference of Eggs.

## EXERCIT. XIII.

**T**Here is a two-fold acceptation of the word Eggs; proper, or improper. An egge in its proper Acceptation is that thing, to which Aristotles definition of an egge doth square: An egge is that thing, one part of which doth constitute an Animal, and the rest doth nourish it, when it is constituted. In its improper acceptation, it is that to which Aristotles definition about the same place is proportioned. An Egge is that thing out of which the whole Animal is constituted. And of this kinde are the eggs of Ants, Flies, Spiders, some kinde of Butterflies, and many other very small egges of that kinde: which Aristotle doth almost every where scruple to call by the name of eggs, but stileth them little wormes. Thus far Fabricius; but we (whose designe is chiefly to treat of the generation of Hen-eggs) have no intention to deliver the severall distinctions of all sorts of Eggs, but only to lay down the diversities of Hen-eggs. Of Hen-eggs therefore, some are new-laid, and some staler, the former are whiter then the later; for time doth cloud them, and especially incubation. The New-laid also have a very small hollownes or cavity in the obtuse angle; and if they be very new indeed, they are something rough with a dust or powder that sticketh to their sides; but those that are stale, as their complexion is darker, so their shell is smother. New-layed eggs (if they be whole) being put near the fire will sweate, and are of much pleasanter taste, and more esteemed of, then other. And eggs after two or three dayes incubati-

on,

Hist. an. l.  
l. c. 5.

de gen. an.  
l. 1. c. 2.

pag. 19.

The di-  
function  
and diffe-  
rence of  
Eggs from  
their Age.

on, are even then sweeter relished then stale ones are: as if the cherishing warmness of the Hen, did refresh and restore them to their primitive excellence and integrity. And after full fourteen days (when the Chicken now beginneth to be downey, and extendeth his dominion over half the egge, and the yolke is almost still entire) I have boyled an egge till it was hard, that so I might discern the position of the chicken more distinctly, which was limned out in the white of the egge, as if the chicken had been cast in a Mould: and yet the yolke was as sweet and pleasant as that of a new-laid egge, when it is in like manner boyled to an induration. The yolke of an egge taken out of a live Hen, and presently eaten, tasteth much sweeter raw, then dressed.

Eggs are likewise distinguishable from their figure; for some are longer, and sharper then others. Out of these oblong and acute eggs (according to Aristotle) are hennes begotten, and of the blunt, cocks. But Pliny saith the contrary; The rounder sort of eggs (saith he) breed Hennes, the other, Cocks. And Columella is of his minde too: If one would have good store of Cocks (quoth he) let him place the longest and sharpest eggs under his Hen; and if the contrary, let him provide the roundest he can get for money. Aristotle's opinion is grounded upon this reason; namely, because the Rounder are the hotter; for it is the custom and condition of heat, to congregate, and fix; and that heat is most powerful, that is most operative. And therefore from the stronger, and perfecter principle, the stronger and perfecter Animal doth arise. Now such is the Male in respect of the Female (especially the Cock being compared to the Henne.) And now on the other side, the lesser sort of eggs are reputed imperfect,

From their Figure.

Hist. an. l. 6. c. 2. l. 10.

c. 52.

lib. 9. de Rust. c. 5.

Scaliger upon the place.

and the least sort of all, utterly *improlificall*. And therefore *Aristotle*, to procure a constant race of *egges* of a fair size, recommendeth the frequent *coition* of cock and hen; for he concludeth the *barren* and *subventaneous* *egges* to be all of the lesser sort, and more insipid; and that because they are moiſter and imperfecter then others. Now this distinction of *egges* here spoken of, is to be understood of the *egges* of one and the same *hen* (for should a *hen* lay *eggs* alwaies of the same dimensions, she would alwaies hatch them all *cocks*, or all *hennes*) because if you take it otherwise, the conjecture of which will be a *cocke* or a *henne*, raised from the *signes* above mentioned, will be very dubious. For several *henns*, lay *eggs* of a several *shape*, and *magnitude*: for some lay *oblong*, some *rounder*, and little differing the one from the other. For though I have sometimes found a difference in the *eggs* layed by the same *henn*, yet the distinction is so exceeding small, that unless a man be very well versed, he will not perceive it. For since all the *eggs* of the same *henne*, are cast and modelled in the same *womb* (as in a *Mould*) they are all impressed with, neer upon, the same *figure*: and therefore it cannot be avoided, but that they should much resemble one another (as those *excrements* that are figured in the same complications of the same *Colon*) insomuch that I my selfe have with ease in a little *basket* of *egges* sorted every *hennes* *eggs* by themselves. And who ever practiseth it, shall be nimble at it. Certainly it is worth our wonder, which dayly experience declareth in *Keepers*. The more diligent sort of *Keepers* of *Parks*, that have the charge of several *berds* of *Deer*, will tell you punctually which and which are the *Hornes* of such and such *Deere*, as often as they cast their



EXER. XIII. *Of the difference of Eggs.*

67

their Heads. A silly, ignorant Shepherd, who had the care of a great flock of *sheep*, grew so well acquainted with every particular *sheep*, that if any one were missing (though he had not arithmetick enough to count them) he could punctually tell which it was, of whom it was bought, and whence it came. And once, to make tryal of him, his Master comanded him, out of forty *lambes* which he penned up in a Fould on purpose, to single out the particular *lamb* of such an *Ewe*, which he did exactly, and carried to the *Damme*. I know some *Huntsmen*; that if they have once seen a *Deer*, or the *hornes* of a *Deer*, or *footsteps* only in soft ground, are able to know the same *Deer* again from all the *Herd* besides, even by those very *horns*, or *tread*: (just as the *Lion* is distinguished by his *Paw*) nay having meerly seen the *print* of the *Deers* *hoofe*, they will exactly resolve, how large the *Deer* is, how *fat*, and how *swift*: as whether he be well in *breath*, or *over-hunted*; and also, whether a *Buck* or a *Doe*. And more then this, there are some, who when forty *Dogs* are pursuing the *Chase*, and are in full *Cry*, will distinguish them all, (though a great way off) and will by their ear inform you, which *Dog* is *first*, and which *behinde*; which *bunteth* upon the *sent*, and which is at a *loss*; whether the *Deer* be still in *flight*, or at a *Bay*, & disputing the conquest with his *hornes*; whether he have *stood* long, or be newly rowled. And all this in the very midst of the *dogs*, *hunters*, and *windings* of the *hornes*, even in a woody *Park*, and where they were never in their lives before. We are not therefore to wonder so much, if those that practise it, can discover which *Egge* belongeth to which *Hen*: I would we could as easily judge which *Son* belongeth to which *Father*.

From  
their Fe-  
cundity.

But the chiefe difference of Eggs consisteth in this, that some are fruitfull, and some addle, which are called *Ova improlifca, irrita, Hypenemia*, or *subventanea*, and *Zephyria*. They are called *Hypenemia*, which being layed by the Hen without conference had with the Cock, are therefore of no use to the generation of Chickens, being stiled *hypenemia*, *quasi a vento prognata forent*, as if they were begotten by the winde: as Varro saith, that

de Re rust.  
c. 1.

Mares in Spain conceive by the Winde. For the West wind is exceeding fruitfull, and thence the name *Zephyrus*, *quasi Ζεφύρος* &, enlivening; for so Virgil:

————— *Zephyrique tepentibus auris*  
*Laxant arva sinus, superat tener omnibus humor,*  
*Parturit omnis ager, &c.*

————— And when warm *Zephyrus* blows,  
The fields dissolve, soft moisture overflows,  
And every Pasture grows.

And therefore the people of old, seeing their Hens in the Spring-time lay, this wind then blowing, did conceive *Zephyrus* to be the Author of the generation of those eggs. Eggs are likewise *Urina*, and *Cynofura* (when the Hen will sit no longer upon them) so called, because egges grow often addle in the Dog-dayes, for the henne deserteth them by reason of the extream Heat; or else because about that time of the year, it thundereth often: for Aristotle saith, that Egges rot, if at the time of the Hennes incubation it chance to thunder. Those egges are esteemed *fecunda*, fruitfull, which (if there be no outward impediment) by a quickning heat will generate chickens; which may be effected not onely by the incubation of the Henne whose

Hist an. l.  
6. c. 2.  
Pliny lib.  
10. c. 54.

whose egges they are, but of any other Fowle of competent magnitude to cherish and cover them, or by any other cherishing warmth whatsoever.

For Aristotle saith, That chickens are as well Ibid.  
hatched upon the ground of their own accord, as by the birds incubation: As in Egypt they cover the egges with dung. And the Story goeth, That a good fellow of Syracuse sate so long upon a mat under the which eggs were layed, that ere he had done tipling the chickens were hatched. The Emperesse Livia is also reported to have cherished an egge so long in her bosom, till the chicken was bred. And to this day in Egypt, and other parts, chickens are hatched by stoves and ovens. An egge therefore (as Fabricius truly affirmeth) is not only the Uterus, and place pag. 19.  
of residence of the chicken, but the matter also on which the whole generation of the fetus doth depend: which generation the egge doth performe and accomplish, both as Agent, Matter, Instrument, Place, and ever other Requisite whatsoever. For certain it is, that the chicken is constituted by an internal principle in the egge, and that there is no accession to a complete and perfect egge, by the Hennes incubation, but bare cherishing and protection: no more then the Hen contributeth to the chickens which are now hatched, which is onely a friendly heat, and care, by which she defendeth them from the cold, and forreign injuries, and helpeth them to their meat. And therefore the Incubation of the Henne is required, that she may upon that relation undertake the education of the chicken, instruct and direct their walks, prepare and look for their feeding, and by the comfort of her wings cherish them. And all these things will not be so well performed by any but her. We have indeed Capons, and mungrel-fowle, such as are the is-



sue of a *Pheasant-cock* and a *Dunghill-benne*, which will sit upon the *egges*, and hatch them too, but they have no dexterity to guide the *chickens*, or mannage the *charge* of their *education*.

I can here but admire (intending to treat larger hereafter of the same matter) with what constancy and patience, almost all *female Birds* will out-sit whole nights and dayes, and impare their *healths*, and almost *famish* themselves; and to what hazards they expose themselves in defence of their *egges*, which, if upon necessary occasions they are at any time constrained to leave, oh! how earnestly, and with what dispatch doe they hasten their return! *Ducks*, and *Geese*, for the time of their absence, cover their *eggs* with straw. And with what undaunted resolution will these feeble parents many times combat in right of their *egges*, which perhaps are *subventaneous* or *addle*, nay sometimes *artificial of-springs*, the issues of *chalk* or *ivory*, whose injuries yet they will revenge with the same magnanimity, with those done to their *legitimate productions*? Indeed the *Birds* affection towards the dull, liveless *egge*, is exceeding wonderful, which is altogether incapable of making any return of *friendship* or *respect*. Who can forbear to be amazed at the affection, or phrensie rather of a *Henne* that is *glocking*, or ready to sit? which nothing can extinguish, but a deluge of cold water; for so long as this rage is upon her, she groweth quite careless, and walkes like a bedlam, with her *wings* trailed, and *feathers* rough, and advanced, and she her self mournful, and restless: if she meet with any *Honne* sitting, she will depose her, having all her thoughts bent upon *egges* and *incubation*; nor will she desist, till shee either get *egges* to sit upon, or *chickens* to discipline: which then

### EXXER. XIII. *Of the difference of Eggs.*

71

then she doth assemble, nurture, feed, and protect with admirable zeal. Who can refrain smiling, to see a *Henne* follow young *Ducklins*, and having hatched up that supposititious brood (apprehending them to be her own) pursue them when they are now swimming in the *Pond*, while she her self circuites about the *brimmes*, and many times attempts to sail after to the hazard of drowning, still calling, and enticing them back, as if they had mistaken themselves.

*Aristotle* giveth this reason why *steril eggs* produce no *chickens*, namely, because the *juices* contained in them receive no *thickening* by *incubation*, neither doth their *yolk* or *white* recede any thing from the nature they were of before. But of this wee shall discourse hereafter, in our general contemplation of *Generation*. Hist. an. l. 6. c. 2.

Our women, that they may distinguish between *egges* that have *chickens* in them, and *egges* that are *barren* and *addle*, after the *fourteenth* or *sixteenth* day from the *Hennes* first *sitting*, do gently drop the *egges* into *warme water*, and those that *sinke* to the *bottom* they account *barren*, but those that *swim*, *fertile*. And if the *chicken* in the *egge* be of any considerable growth, and bestirre himself lustily, the *egge* will not onely tumble up and down, but leap and caper. And if you listen close for some dayes before exclusion, you may perceive the *chickens* kick, make a noise, and cry after their manner. Which kinde of *Commotions* when the *Sitting Henne* discovereth in her *nest*, she removeth the *egges*, and rowleth them to and fro, (as *carefull mothers* do their *disquiet* and *peevish infants* in the *cradle*) till the *chickens* being accommodated with convenient posture, lye hushed, and still.

*Hens-eggs* are likewise distinguished from their From  
Number.

F 4

Number.

## Of the difference of Eggs. EXER. XIII.

**Number.** For some Hens (saith the Philosopher) lay all the year long, bating onely the two Winter moneths. Some gallant Hens will bring sixty eggs before the Sitting time; yet these are not so fruitfull as the ordinary sort of Hens. The Adrian Hens are small, but lay every day; yet they are very testy, and many times kill their chickens; and their feathers are of changeable colours. Some domeslick Hens will lay twice a day; and the fecundity of some, shorteneth their dayes.

Some Hens in England lay every day; but the ordinary fertile race, for the most part, lay for two dayes together; namely, the first egg in the morning, the second in the evening following, and the third is a day of vacancy. Some Hens have an unlucky custome to break their eggs, and leave their nests; but whether this be their disease, or vice, is yet unresolved.

Incuba-  
tion.

There are differences also taken from Incubation; for some Hennes sit once, some twice, others thrice, and some oftner. Florentinus writeth, that certain Hennes, Natives of that Alexandria which is in Egypt, called *Monosira*, of whom springeth a race of Game-cocks, doe sit two or three times, having the chickens which they have newly hatched taken from them, & brought up apart. By which means it cometh to pass, that one Hen will hatch forty, sixty, and sometimes more chickens at one sitting.

Magni-  
tude.

Some Eggs also are of a large, some of a less, and some of the least size of all; and these last are commonly called in Italy, *Centenina*; and our Women, to this day, (as of old also) bely them to be Cocks-eggs, and that they produce Basilisks. The Common people (saith Fabricius) think this small egge to be the Hennes concluding production, after she hath layed an hundred eggs (from whence it is called *Centeninum*, the Hundredth egge) which hath no yolk at all; yet

pag. 10.

hath



### EXER. XIII. Of the difference of Eggs.

73

hath all the other parts, as the Chalazæ, the Whites, the Membranes, and the Shell. For it is likely that this is then layed, when all the yolkes are already completed into Eggs, and there is no more remaining yolks in the Vitellary, that may become eggs; but yet on the other side, there is still some little White behind, and out of that Modicum of White it is probable this little Egge is framed. But this seemeth not probable to me; because it is an assured truth, that when the Ovary is exhausted, the Second Uterus ~~and~~ (as himselfe confesseth) is also spent, and wasted into a meer membrane, not containing any residue of the White, or Moisture at all. Fabricius goeth on: There is found a two-fold Ovum Centeninum, one without a yolk, (and this is properly called Centeninum) which is the last the henne layeth, with which the henne concludeth her Laying for that season: the other also is a very small egge, but hath a yolke, and is not the concluding, but some intervenient egge, after which the henne doth persist to lay egges of a just magnitude, as before; but it faileth in its dimensions, by reason of some impair in the vegetal faculty, as it happeneth to Peaches, and other Fruits, whereof some are of a full growth, and others exceeding small. He might have accused for this mischance, the inclemency of the Aire, and Soile, also the penury, and pravity of the nourishment. But, that the last Egges are alwaies very little, I cannot willingly consent.

Nor are even Egges without their Monsters. For the Augurs (saith Aristotle) did account it Ominous, when Eggs were laid that were all yolke; or when such egges were found in the henne, she being cut up, under the Septum Transversum, and they of the magnitude of a Perfect Egge.

Aldrovand. Ornithol. l. 14. pag. 260

And hither may be referred Ova Gemellifica, Twinne-eggs, which are furnished with two yolkes; such

such as I lately found in the *Uterus* of a *henne*, it being complete, and guarded with a *Shell*, having *Yolks*, *Cicatrices*, and the *grosser Whites*, all double : it had also four *Chalazæ* ; but, as for the *White* of *thinner consistence*, there was onely *One*, which did encompass all the rest : it had also two onely common investing *Membranes*, and one single *Shell*. For though *Aristotle* affirme, that some *hennes* alwaies produce such *Eggs* ; yet, that it so happeneth by the course of nature, I can hardly believe. And though two *chickens* may be hatched out of such *Eggs*, (which I have experimented, contrary to *Fabricius* his perswasion, who saith, that of such an *eg*, the *chicken* hatched will have four legs, two heads, & four wings ; of which hereafter) yet they are not vital, but commonly dye soon, and that either for defect of *Aire*, or room in the *Shell*, or that one is an impediment to the other, and doth violence to it ; for it cannot be, that both should be equally ready and ripe for *Exclusion*, and that one should not prove an *Abortion*.

To summe up all : The Differences of *Eggs* are chiefly of three kinds : For some are *Fertile*, and some *Addle* ; some produce *Cocks*, and some *Hens* ; some spring from *Parents* of the same species, and some from *Parents* of a diverse species, and so bring *mongrel-chickens* ; such as are conceived from a *Dunghill-hen*, and a *Cock-Pheasant*, and so resemble either the *Cock* that obtained the first, or last *Coition*.

Hist. an. l.  
6. c. 2.

For, according to *Aristotle*, the *egge* which is constituted by *Coition*, passeth from its own kinde into another, in case the *henne* proceed to *Coition*, (having either a barren *egge* in her, or else an *egge* conceived by the semen of *cocks* of different kinde) before the *yolk* have procured its white. And thus are barren *eggs* fructified,

### EXER. XIII. Of the difference of Eggs.

75

fructified, and fruitfull eggs entertain the form of that cocke, who had the last courtesie in Coition. But if the White be already obtained, it cannot be, that either barren eggs, should be altered into fruitfull; or that those eggs which are already conceived by Coition, should pass into the kinde of that cock who was last entertained. For the Cocks semen is (as Scaliger sharply observeth) like A Testament, where the last will is that which taketh place. In loc.

To these differences may be perhaps added, that, whereby some Eggs are strong, ueget, and (if wee may so say) *couragious*; for as there is a soule in Eggs, so have they likewise a competent vertue. For as in other sorts of Animals, some Females are so libidinous and full of *venery*, that they take like *Tinder*, from one single act of Coition (be it never so feeble, and the male never so impotent) and conceive forthwith, and bring diuerse fetuses by that one act: others again are so *dull* and *suggish*, that unless they be provided with a more generous male, and him also highly *inflamed* (and the coition likewise repeated and continued) they will remain unsuccessful. The same also befalleth in Eggs, whereof some, though conceived by coition, are *improlificall*, unless they be impowered by repeated, and continued coition.

Hence it cometh to pass, that some egges are quickly altered, and after three dayes of Incubation. discover some rudiments of a fetus: but others are either easily corrupted, or are slow in their progress towards chickens, and yield no expectation of a chicken, even at the seventh day: As shall be hereafter proved, in the discourse of the Generation of the Pullus, or Chicken out of the Egge.

And thus farre of the Womb of the Hen, and its Office: as also of the Generation of the Hen-egge, its differences,



*differences, and accidents* : wherein we have delivered what we have experimented our selves ; by which you may give judgement of other *Oviparous creatures*.

It now remaineth that we should prosecute our *history*, of the *Generation*, and *Formation* of the *Fœtus* out of the *Egge*. For (as I informed you before) the whole *Contemplation* of the *brood of Hens* and *Cocks* is comprehended in these two things ; namely, how the *Egge* is produced of the *Henne* and *Cocke*, and how the *Cock* and *Henne* are framed out of an *Egge* : and by this circle the propagation of their *Race* may by the benefit and favour of *Nature*, be prolonged, and continued.

Of the generation of the Fœtus  
out of a Hen-egge.

EXERCIT. XIV.

**W**Ee have already discovered the *Formation*, and *Generation* of the *Egge* ; it remains that we now deliver our *Observations*, concerning the *Procreation* of the *Chicken* out of the *Egge*. An undertaking equally difficult, usefull, and pleasant as the former. For *Natures Rudiments* and *Attempts* are involved in obscurity and deep night, and so perplext with *subtilties*, that they delude the most piercing wit, as well as the sharpest eye.

Nor can we easier discover the secret recesses, and dark principles of *Generation*, then the method of the *fabrick*, and *Composure* of the whole world.

world. In this reciprocal interchange of *Generation* and *Corruption* consists the *Aeternity* and *Duration* of mortal creatures. And as the *Rising* and *Setting* of the *Sun*, doth by continued revolutions complete and perfect *Time*: so doth the alternate vicissitude of *Individuums*, by a constant repetition of the same species, perpetuate the continuance of fading things.

Those Authors which have delivered any thing touching this subject, do for the most part tread a several Path: for having their Judgements preposessed with their own private opinions, they proceed to erect and fashion principles proportionable to them.

*Aristotle* of old, and *Hieronymus Fabricius* of late, *Hist. an. l. 6. c. 3.* have written so accurately concerning the *Formation* and *Generation* of the *Fetus* out of the *Egge*, that they seem to have left little to the industry of *Posterity*. And yet *Ulysses Aldrovandus* hath undertaken the description of the *Pullulation* or formation of the *Chicken* out of the *Egge*, out of his own Observations: wherein he seems rather to have directed and guided his thoughts by the Authority of *Aristotle*, then his own Experience. *Ornithol. l. 14.*

For *Volcherus Coiter*, living at *Bononia* at the same time, did by the advice of the said *Aldrovandus* (whom he calls *Tutor*) dayly employ himself in the opening of *Egges* then sat upon by the *Hen*, and hath discovered many things truer then *Aldrovandus* himself, of which he also could not be ignorant. Likewise *Æmilius Parisanus* (a *Venetian* Doctor) despising other mens opinions, hath fancied A new procreation of the *Chicken* out of the *Egge*. *Nobil. exer. l. 6.*

But because somethings, (according to our experience) and those of great moment and consequence,

quence, are much otherwise, then hath been yet delivered, I shall declare to you what dayly progress is made in the egge, and what parts are altered, especially about the *first dayes of Incubation*; at which time all things are most intricate, confused, and hard to observe, and about which *Authors* do chiefly stickle for their own observations, which they accommodate rather to their own preconceived persuasions (which they have entertained concerning the *Material* and *Efficient causes* of the generation of *Animals*) then to truth her self.

What *Aristotle* relates concerning the *Procreation* of the *Chicken*, is most true in it self; yet like one who had not experimented the matters himself, but had received them from other experienced persons, he doth not rightly distinguish them by their proper times: and is very much mistaken concerning the place in which the *first principle* of the *Chicken* is cast, which he decrees to be in the *Acute Angle* of the *Egge*, and is therefore justly reprehended by *Fabricius*. Nor doth he seem to have observed the beginning of the *Pullus* in the egge, or to have been able to have found those things there, which he accounts necessary to every Generation. For he would have the *White* (because nothing can possibly be made of nothing, according to the natural course) to be the *Matter constituting* the *Chicken*. Nor did hee sufficiently apprehend how the *Efficient cause* (namely the *Cocks seed*) can act without a contact; or how the *Egge* could of its own accord, without any inherent geniture of the *Male*, ingender the *Fetus*.

*Aldrovandus*, partaking of the same error with *Aristotle*, saith moreover, (which none but a blind man can subscribe to) that the *Yolk* doth in the first dayes, arise to the *Acute Angle* of the *Egge*: and thinks



EXER. XIV. out of the Henne-egge.

79

thinks the *Grandines* to be the *Seed* of the *Cock*; and that the *Pullus* is framed out of them, but nourished as well by the *Yolk* as the *White*: which is clean contrary to *Aristotles* opinion, who conceived the *Grandines* to conduce nothing to the fecundity of the *Egge*.

*Volcherus Coiter* delivers truer things, and more consonant to *Autopsie*, yet his three *Globuli* are meer fables. Nor did he rightly consider the principle, from whence the *Fetus* is derived in the *Egge*.

*Hieronymus Fabricius* indeed contends, that the *Grandines* are not the *Seed* of the *Cock*: and yet he will have the body of the *Chicken* to be framed out of them (as out of its first matter) being made fruitful by the *Seed* of the *Cock*. He likewise saw the Original of the *Chicken* in the *Egge*; namely the *Macula*, or *Cicatricula* annexed to the membrane of the *Tolke*, but conceived it to be onely a *Relique* of the *stalk* broken off, and an infirmity or blemish onely of the *Egge*, and not a *Principle* part of it.

*Parisanus* hath plentifully confuted *Fabricius* his opinion concerning the *Chalaze* or *Grandines*, and yet himself is evidently at a loss in some certaine circles and points of the *Principle* parts of the *Fetus* (namely the *Liver* and the *Heart*;) and seems to have observed a *Principium*, or first *Principle* of the *Fetus*, but not to have known which it was, in that he saith, That the *Punctum Album* in the Middle of the Circles is the *Cocks Seed*, out of which the *Chicken* is made.

So that it comes to pass, that while each of them desire to reduce the manner of the *Formation* of the *Chicken* out of the *Egge*, to their own pre-conceived opinions, they are all wide from the mark.

For some conceive the *Seed* and *Blood* to be the *Matter* which doth constitute the *Chicken*: Others conceive

conceive the *Seed* to be the *Efficient* and producing cause, or *Artificer* that builds the *fabrick* of it: when yet upon deliberate consideration it appears most infallible, that there is *no matter at hand at all, nor no menstruous blood*, which the *Seed* of the *Male* can fall to work upon, or coagulate: (as *Aristotle* would have it) *nor is the Fœtus made of the Seed of Male or Female, or any commixture of them both.*

---

*The first Inspection of the Egge, or  
what the first day of Incubation  
doth produce in the Egge.*

EXERCIT. XV.

**T**HAT we may the better discover what the *first day* of incubation hath produced in the *Egge*, we must first know what alterations will befall on *egges* of their own accord; by which a *stale egge* is distinguished from a *fresh*, (without any consideration of the *Hens* fitting at all) that so it may appear, what is wrought by the very incubation it selfe. There is therefore (as we have declared before) in all *egges*, a certain cavity or hollow in the blunt end of the *egge*; which cavity as the *egge*, groweth *staler*, increaseth accordingly: especially in hot Countries and seasons (by reason of the exhalation of a thinner part of the white:) as we have spoken in the *History* of the *egge*. And while that cavity doth exspatiate, it enlarges more according to the *longitude*, then *latitude* of the *Egge*,

EXER. XV. *The first inspection of the Egge.*

81

Egge, and obtaineth a figure at last, which doth recede from being orbicular.

The Egg-shell being now less transparent, groweth cloudy.

The *White* groweth thicker, and more viscous, tending towards a duskey or Straw-colour.

The Proper membrane or coat of the Yolk becometh more remiss and loose, shrinking up into wrinkles.

The *Chalazæ* continue still the same place, site, and consistence, at each end of the egge (and that not in new-layed egges onely, but stale ones; nor in those alone that are conceived after coition, but wind-eggs also;) by whose firme connexion, the Yolk and White are so fast cemented together, that both retain their proper position. For these are two stabiliments mutually opposed, or the Poles and hinges of this Microcosme: so composed, as if they were onely a conflux of the numerous coats of the White, and were wound as it were into a knotty cord, at both ends where they respect the yolk. And thence it cometh to pass, that the yolk is not easily parted from the company of the White, except the *Chalazæ* be first divided: which done, they presently dis-join. And by the assistance of these hinges, the yolk is both fixed in the center, and preserved in its right consistence. So that the chief part of all, namely the *Cicatricula*, retaineth still the same region or altitude in the Egge, and continueth in a middle space from both the extremities. For this Spot, or *Cicatrice*, as well in a stale, as new-laid egge, is still found in the same consistence, magnitude, colour, and site. But so soon as ever the egge inclineth to Pullulation, be it either from the Incubation of the Hen, or the accession of any other fostering heat whatsoever, this Spot is presently dilated,



lated, and widened like the *Ball* of the eye : and from it (as from the choicest center of the egg) the secret *plastick faculty* doth issue out, and germinate. And yet this first Principle of the egge was never yet (to my knowledge) observed by any man.

Now, at the second day of Incubation, when the Egge hath grown warm four and twenty houres under the Hen, as its cavity which is in the obtuse angle is much amplified, and fallen lower ; so also doth the interior constitution of the egge vary and change. For the *Yolk* which before stuck fast in the center of the *White*, ariseth towards the blunt angle ; and the middle part of it, where the Spot is ingrafted, is elevated, and applyeth it self to that membrane which encompasseth the cavity, so that now the *Yolk* seemeth to be annexed to the cavity by the *Cicatrice*. And as much as the *Yolk* riseth upward, so much is the grosser part of the *White* depressed towards the acute or lower angle. Whence it appeareth (as *Fabricius* rightly noteth) that either Aristotle was in an errour, or else that there is a fault in the impression, where it is said, About that time (namely, within three dayes and as many nights) the yellow humour is lifted to the top, there where the eggs beginning is, and where the egge is naked there about (namely, at the dilated cavity.) For Aristotle calleth that the beginning where the Acute Angle is, which parteth last from the Henne. But notwithstanding all this, it is an undoubted truth, that the *Yolke* ariseth towards the Blunt angle of the egge, and that the cavity is there dilated. And so questionless *Aldrovandus* is deceived, who (though he speak as if he had experimented the matter) saith, that the *Yolk* riseth to the Acute angle. I confess, I have sometimes seen, about the

second

Hist. an. l.  
6. c. 3.

Ibid. l. 3.  
c. 2.

**EXER. XV. The first inspection of the Egge.**

83

second and third day, the *Cicatricula* dilated, and a foundation laid towards the formation of the *Fetus*, when the *yolk* as yet was not ascended. But this is very rare, and I conceived it to happen so, by reason of the imbecillity, and infirmity of the Egge.

On the second day of Incubation, or first of Inspection, the fore-said Spot is dilated to the magnitude of a *Pease*, or *Lentil*, and is divided into circles, (as if they were drawn by a pair of Compasses) which have a very small white Point for their Center. It is very probable, that *Aldrovandus* also did observe this *Macula*, or Spot; for he saith, In the midst of the yolk there appeared some kinde of whitish thing. So did *Coiterus*, where he saith, The second day, there remained in the middle of the yolke a whiter part. And *Parisianus* also, who saith, The second day, I saw a white substance about the bigness of an indifferent faire Lentile, and of that figure: and this (saith he) is the Cock's semen, enwrapped in a white and most slender coat, lying under the two common membranes of the egge, but above the proper containing coat of the yolke. And yet I conceive, that no man hitherto hath acknowledged, that this *Cicatricula* was to be found in every egge, nor that it was the first Principle of the Egge.

In the meane while the *Chalazæ* or seed-pearls, do decline on each side from the two ends of the egge, towards the sides: and this proceedeth from the shifted scituation of the *White* and *Tolk*. So that one of the *Chalazæ* descendeth something from the obtuse angle, and the other ascendeth proportionably, from the *Acute*; as in an *Oblique Sphere*, by how much one *Pole* is elevated above the *Horizon*, by so much is the other depressed under it.

G 2

And

*The first inspection of the Egge. EXER. XV.*

And now the Yolk (especially about that part where the *Cicatricula* resideth) doth begin to dissolve and melt a litle, and the proper coat thereof (which in staler egges is remiss, slack, and wrinkled) groweth smooth and full; the Yolk it self also seemeth to have regained the same colour, consistence, and inoffensive taste, which it formerly had, when the egge was new.

And this is the first dayes Progress of the Egge, towards a Chicken, and the first platform of its approach. But *Aldrovandus* addeth, that there is as yet no alteration at all in the White; wherein hee saith right. But where he affirmeth, that the Semen of the Cock is perceived in the Yolk, he is apparently in the wrong. His Argument by which he would maintain the *Chalazæ* to be *Semen Galli*, is exceeding slender, and that is, because egges which are destitute of these *Chalazæ*, are not fruitful. Hee is much in the right; for indeed they are not Eggs without them. For in all eggs, be they fertile, or not fertile, these *Chalazæ* are inseparable In-mates. But perhaps the Good-wives deceived him (which call these *Chalazæ*, *Galladura*, in Italian) and so betrayed him into the common Heresie. Nor is *Hieronymus Fabricius* less guilty of Imprudence, who offereth to our view the formation of the *Pullus*, graven in several Tables; contending, that it is boddyed, and constituted out of these *Chalazæ*; not so much as taking notice, that the *Chalazæ* are all this while both of them entire, and unaltered (having onely removed their stations) and that the *Exordium* of the Chicken is to be sought a good distance from the *Chalazæ*.

The



The second Inspection of the Egge.

EXERCIT. XVI.

When two dayes are now passed, the afore-  
said circles of the *Cicatricula* are more ample, and conspicuous, being of the breadth of the *Ring-finger*, and sometimes of the *Middle*; where-  
in the whole *Macula* or *Spot* is divided into two  
(and sometimes into three) *Regions*, and those  
oftentimes inammelled, and obscurely shadowed  
with several colours; fully representing the figure  
of an *Eye*, and that not only by reason of its pro-  
tuberance, like that in the *Tunica Cornea*, or horny  
*membrane*, or coat of the *Eye*; but magnitude al-  
so, and likewise of that most transparent, most lu-  
cid humour contained in it: whose *Center* repre-  
senteth the *Pupilla*, or sight of the eye; but having  
a white point fixed in the center, it resembleth the  
eye of some small *Bird*, where the middle of the  
*Pupilla* is blemished and disfigured by some suffu-  
sion, or *Cataract*: (as they call it) and from this  
Resemblance we call it *Oculum Ovi*, the *Eye* of the  
*Egge*. Between these *Circles* is contained a most  
bright refulgent liquor, clearer then any *Crystal-  
line humour* in the world; which if you look upon  
against the light, the whole *Macula* will now ra-  
ther appear in the *White* of the *Egge*, then rivited  
into the *membrane* of the *Yolke* (as formerly it did)  
and (like some part or portion of the *White*, dis-  
solved, and clarified) contained and bounded  
within a most slender coat belonging to it self. And  
this is the reason why I call this Liquor, *Oculum*,  
the *Eye*, or *Colliquamentum Candidum*, the white

dissolved substance ; as if it were some portion of the *white* of the Egge, melted and liquefied by the heat shining in its own sphere apart, (unless it be scattered and distracted by concussion) and seemeth like a more refined, and more concocted, spirituous part, distinguished from the courser *White* by a peculiar inclosure of its own, and seated and enthroned in the midst, between both *Yolk* and *White*. It as much surpasseth the rest of the *White* in clearness, and transparence, as the most *Crystal Spring* excelleth the troubled *Lake*. The Coat encircling this humor, is so nice and fraile, that (if you be not exceeding circumspect) it will soon be rent, and so disparage the purity of this, with the confusion of other liquors.

And here my thoughts were a long time strangely divided, what I should resolve concerning this *Candidum, colliquamentum* ; whether I should name it the *Calidum Innatum*, or *Humidum Radicale*, the *Radical Heat*, or *Moisture*, or the prepared matter from which the future fetus was to take its rise ; or the *Aliment* exactly concocted, such as the *Ros* is reputed to be amongst the *secondary humours* ? For I was fully satisfied (as I shall declare hereafter) that in the midst of this the first rudiments of the *Fetus* lay, and that this also was its nourishment, and after it was of some growth, the place of its abode.

Hence it appeareth, that this *Colliquamentum* is soon enlarged, (namely in the compass of a day) as is evidently deciphered in *Fabricius* his second Figure, especially the inward *Region* of it ; which, while it dilateth it self, it obliterated and quite expungeth the outward. As you may observe in the *Eyes* of those creatures whose sight of the *Eye* is very large, and therefore they see better in the  
Night

VI.  
on of  
the  
be  
em-  
iri-  
by  
in-  
bile.  
ear-  
ring  
ling  
ube  
ene,  
miser-  
  
ang-  
this  
ame  
the  
inter  
life:  
e Ros  
urs &  
creat-  
ts of  
righ-  
place  
  
m is  
ay)  
ond  
rich,  
uite  
ein  
Eve  
the  
right

Ex. XVI. *The second inspection of the Egge.*

87

Night then in the Day (of which kinde are Owles, Cats, and the like; whose Sight is most dilated in the dark, but more contracted in the Light :) For if you transerre such a creature nimbly from the light into the shade, you shall perceive plainly how the the sight is distended, so that it will much diminish the other circle, (which is called the Iris) and almost quite over-run it.

Parisanus lighting upon these circles, was much mistaken; for he mustereth up amongst his circles, a white one, a yellow one, one of the complexion of honey, and another white one besides; asserting the fœtus to be made of the middle white point (which doth indeed really appeare in the midst of those circles) which he fancieth to be the Semen Galli. And that he may approve himself more cunning and subtile yet, Before (saith he) there appeareth any blushing or redness in the body of the Fœtus, there are in it as it were two exceeding small Bullulæ or Bubbles; neither of which hath any ruddiness at all at the first: and one of these Bullulæ he would obtrude upon us for the Heart, and the other for the Liver. But the truth is, that no such Bullula is to be seen at all, before a sanguine ruddiness doth appear; Nor doth the Fœtus look red at all at first; Nor do any of those Bullulæ give us any representation at all of a Liver, but both of them express the two Ventricles of the Heart, and by leaping (as shall be explained hereafter) do make mutual returns to one another by their Systole and Diastole.

Aristotle seemeth to have understood this colligamentum, where he saith, *About that time (namely the third day) there is a certain membrane divaricated with certain sanguineous fibers, which contain a white liquor, arising from the striggs of those veines.* For by white liquor, he could not mean the whole



white of the egge; because the coat of the white is not then sprinckled with veins, but onely the coat of this *colliquamentum*. And therefore he saith, There is a membrane also, intimating a distinct membrane from those of the Yolk and White, in that he saith it ariseth from the striggs of the veines, about the third day. Coiterus also seemeth to have acknowledged this *colliquamentum*, saying, Some part of the White approacheth neerer to whiteness then the other, and some to density. Now the aforesaid *colliquamentum* is encompassed with its proper coat, and is distinct and separate from the rest of the White, before any part at all of the blood appear.

We shall have occasion to discourse hereafter of the mighty use of this *colliquamentum*, in relation to the *fetus* of all kinde of Animals. For while they swim there, they are guarded, and skreened from all concussion, contusion, and other outward injuries, and are also nourished by it.

I saw long since a *fetus* of the magnitude of a Pease-cod, cut out of the *Uterus* of a Doe, which was complete in all its members (so that it was apparently a Male by the parts :) I shewed this pretty Spectacle and Rarity of Nature to our late King, and Queen. It did swim, trim and perfect, in such a kinde of White, most transparent, and *crystalline* moysture (as if it had been treasured up in some most clear glassie receptacle) about the bigness of a Pigeons egge, and was invested with its proper coat.

*The third Inspection of the Egge.*

## EXERCIT. XVII.

**W**E have seen the second *Progress*, or preparation of the Egge towards the *Fætus*, which falleth within the *third dayes Observation*. It followeth that we now attend the *third Appearance*; which presenteth it selfe to our view after three daies and as many nights.

And of this *Aristotle*: *There doe begin to appear* *Hist. 11*  
*some indications of Generation in Hennes, after three* *6.c.3.*  
*dayes, and so many nights*; (as suppose upon *Munday morning*, in case that on the precedent *Fryday-morning* the Eggs were layed under the *Hen*, then ready to sit) and the declaration of this *Inspection*, is the purpose of *Fabricius* his third *Figure*.

If therefore you observe on the *fourth day*, you will meet a great *Metamorphosis*, and wonderfull alteration; which are more evident, for almost every hour all that day long: about which time the Egg beginneth to step from the life of a *Plant*, to the life of an *Animal*. For now the *Limbus* or *bemme* of the *colliquamentum* beginneth to blush and purple, being encompassed with a slender bloody line: and in the center almost of it, there leapeth a *capering bloody point*, which is yet so exceeding small, that in its *Diastole*, or *Dilatation*, it flasheth onely like the most obscure and almost indiscernable spark of fire; and presently upon its *Systole* or *Contraction*, it is too subtile for the eye, and quite disappeareth. So slender are the first *Rudiments* of *Creatures* lives, which the *Plasical faculty*

culty sets on foot by so undiscoverable beginnings.

If you are desirous to make discovery of this observation toward the declining of the third day, you may if you be extremely intent, by the assistance of a clear & great light, or by the Sun beams, or a Perspective, make a shift to discern it. For else, this purple streak is so exceeding nice, and fine, and the motion of the *Punctum saliens* is so imperceptible, that you will only loose your labour. But, at the beginning of the fourth day it is evident, and at the end thereof, most notoriously visible, that the *Punctum sanguineum saliens* hath now *Animal motion* (saith Aristotle) in the candid liquor: (which I call *colliquamentum*.) And from that (Point) two hollow threads like veines, full of blood, are carried crooked to the purple Line, and the coat encompassing the *colliquamentum*: scattering as they pass along many fibrous branches through the whole space and continent of the *colliquamentum*, all which spring from the same Original (as the boughs of Trees from the same Trunke,) In the crooked Angle of this Root, and the Middle of the *colliquamentum*, the *Punctum Rubrum Saliens* is enthroned, which keeps time and decorum in its pulsation, compounded of a *Systole*, and *Diastole*. In the *Diastole*, as if it did imbibe a larger proportion of blood, it dilates it self, and leaps; but connives in the *Systole*, as if it suffered a convulsion by the stroke, and resigned the blood again.

Fabricius hath described this *Punctum* or Point, in his third Figure, and, (which is strange) took it for the body of the Fetus; as if either he had not observed its leaping, and pulsation, or else had not understood that text of Aristotle, or at best had forgotten it. But that which is yet more strange, is,

that



Ex.XVII. *The third inspection of the Egge.* 91

that he should be nothing mindfull all this while of his *chalazæ*, from which himself deduces the rudiments of the chicken.

*Ulysses Aldrovandus*, a Writer in *Bononia*, about *Ornithol.* that time saith, There appeared in the White a little kinde of *Punctum saliens*, or capering Point, which is the same which *Aristotle* decrees to be the Heart. Out of which I plainly discovered a little Trunke of a vein to arise, and two other little branches tending towards this, which were those very channels of blood, which he had wrote to be sent forth to the two coats encompassing the Yolk and White. Now I am clear of his Opinion, conceiving those passages to be Veins, and to have a pulsation, containing a purer blood in them, and such as is usefull and proper for the generation of the more principle parts; namely, the Liver, and the Lungs, and the like. But both these are not veines, nor have they both a pulsation; for one is an Arterie, the other a vein, as wee shall hereafter shew: where we shall also declare, that these Meatus do become the Umbilical vessels of the Fetus.

*Volcherus Coiter* hath these words: The little bloody Point, or Globulus found before in the yolke, is now rather in the white, and evidently pulsatile. Now he is out, in saying, It was found before in the yolke; for that Point which was in the yolke was white, and did not leap neither; nor doth the bloody point or Globulus appear to leap the second day after Incubation. But that Point (which we have declared to be placed in the Middle of the round, as if it were the center, and which is annexed to the yolke) doth vanish quite away, before the Point, which *Aristotle* calleth *Punctum saliens*, can be discerned at all, or (as I believe) becometh red, and leaping. For both these Points are seated in the center of the *colliquamentum*, and neer the root and original

original of the *veines* which spring from thence : but they are never seen together, but the *Red*, which is the *Punctum saliens*, succeeds in the place of the *White* one.

In this indeed *Volcherus* is in the right, where he saith, *The Punctus saliens is now rather found in the White, then in the Yolke*. By which words, I was incited to make diligent search, whether the *Punctus albus* be transmuted into the *Punctum sanguineum* ; because both of them are almost of the same magnitude, and did seem situate in the same place. And sometimes, I found, the glistening purple circle which is the outermost, ending about the *vermilion horizon*, encompassed by the *Colliquamentum* ; in whose center there was the *Punctus albus*, but not the *Ruber*, or *Saliens* : but I never saw those two Points together. This disquisition is of great moment ; namely, Whether there be blood before *Pulsation*, and, Whether the *Punctus* arise from the *Veines*, or the *Veines* from the *Punctus* ?

According to my observation the *Blood* seems to be before the *Pulse* ; and I therefore believe it, because, Upon *Wednesday* about the *Evening*, I put three egges under the *Henne*, and upon *Saturday*, a little before the same time, I found these egges cold, as being forsaken by the *Henne* ; however, opening one of them, I found the rudiments of a *Chicken* ; namely the *Purple* and *bloody Line* in the circle : but in the center, instead of the *Punctum saliens*, I found the *Punctum album*, which is bloodless. By which I perceived the *Henne* had not long deserted her charge : whereupon, seizing upon her by force, I penned her up all night, having first layed the two former remaining egges, with other that were not there before, into the *Nest*. Now for the success : The next morning betimes, my two egges

were

were well recovered ; and I found in the center the *Punctum Micans*, which was much less then the *Punctum Album* ; out of which (namely the *Punctum Album*) a spark or lightning, darting as it were from a cloud, appeared in the *Diastole* onely. So that to my Apprehension, the *Punctum Rubrum* did leap out of the *Punctum Album*, at least that *Punctum* is generated in the *Punctum Album*, and Blood being now there, hath its Birth, or at least its Motion there. Nay, I have many times observed, The *Punctum saliens*, when (as quite expired) it lay deprived of all motion, it hath regained fresh motion and pulsation, by a new heat and cherishing. Therefore in order of Generation, I conceive that the *Punctum* and Blood do first exist, but the pulsation arriveth not till afterward.

And this is most certain, that nothing at this time appears, besides the bloody streaks, the *Punctum saliens*, and those Veins which are all derived from one Trunk (as that Trunk it self from the *Punctum saliens*) and do afterward constitute the *Umbilical Vessels* : which being disseminated farre and wide, the fetus at length (according to it growth) doth attract sustenance from the Yolk and White. You may see a lively resemblance of these Veins & their propagations in the leaves of Trees, whose fibres do all proceed from the *pedunculus* or stalk, and are diffused from one Trunk through the whole capacity of the Leaf.

This whole entire *Colliquamentum*, distinguished and sprinkled with bloody fibres, representeth the form & magnitude of the two wings of a Butterflie. And it is no other then that Membrane which Aristotle speaks of, where he saith, The Membrane divaricated with bloody fibres, containeth then a white liquor, springing from those Meatus of the Veins.

In loc. supra  
dist.

And



About the end of the *fourth*, and beginning of the *fifth day*, being now enlarged, it seemeth to be changed into a small thin bladder, containing blood in it ; which it ejects at every *contraction*, and recalls again at every *diastole*.

Hitherto I could not discover any distinction of *Vessels* : for the *Arteries* do not yet differ from *veines*, either in *coat*, or *Pulsation* : and therefore I call the *vessels* indifferently *veines*, or with *Aristotle*, *Meatus Venales*, *Veinal Passages*, or *Channels*.

This *Punctum* (saith *Aristotle*) now bestirres it self like an *Animal* ; for *Motion* and *Sense* distinguish an *Animal* from a *non Animal*. Since therefore this *Punctum* begins now first to move, wee may justly say it hath put on the nature of an *Animal* : and that the *Egge* which was before endowed with a *vegetative soule*, is now over and above that, furnished with a *Motive* and *sensative power* ; and is raised from a *Plant* to an *Animal* : and that at the same time the *soule* of the *Fetus* is gone in, which first formes the *chicken* out of the *Egge*, and afterward informs that *chicken*. For *Aristotle* demonstratively resolves of the *Faculties*, by the *Operations* ; and from them also concludes of the cause and fountain of *Life* (namely the *Soul*) and that to be in, *actually*, (where the *Operations actually* are.)

Lib. de A-  
nimâ.

And I am confirmed by many proofs and *experiments*, that not *motion* onely is now the companion of the *Punctum saliens*, but also *Sense* it self. For upon every touch, be it never so gentle, it is variously provoked, and disturbed, (at the same rate as *sensative* bodies proclaime their distastes by particular *motions*) and so offended with repeated injuries, that they did confound the chime and

order

order of its pulses. So in the *Plant*, called the *sensitive Plant*, and other *Zoophyta*, we conclude there is *sense*; because upon touch they contract themselves, and take it unkindly.

I have, I say, often seen, and so have many more who have been present, this *Punctum*, upon contaction by a *needle*, *probe*, or the finger it self, nay upon the admission of a more searching *heat* or *cold*, or any other thing that could molest, and disorder, declare many *symptoms* of its *resentment*; for it would flie into many *permutations* of *pulse*, beating much stronger, and nimble then before. So that, no question, this *Punctum* doth (as an *Animal*) *Live*, *Move*, and *Perceive*.

Moreover, expose an *egge* too long to the colder *aire*, and the *Punctum saliens* beats slower, and hath a languishing *motion*; but lay your finger warm upon it, or cherish it kindly any other way, and it presently gaineth *strength* and *vigour*. And after this *Punctum* hath declined by degrees, and being full of *blood* hath ceased from all *motion*, exhibiting no *specimen* of *life* at all, and was given up for lost, and dead, upon laying of my finger warm upon it, for the space of only *twenty pulses*, the poor heart hath awaked, and recovered again, and as it were rescued from the grave, proceeds to its former *harmony* afresh. And this hath been done again and again by me, and others, by any other reviving heat, were it of the *Fire*, or warm *Water*: as if it were in our dispose to condemne the little *Soule* to the *Shades*, or reprove it to *life*, at pleasure.

What we have here delivered, doth for the most part come to pass the *fourth day* from the *first Incubation*, or at the *Third Inspection*. I say, for the *most part*; for it falls not out perpetually so, because there

there is a great diversity in the maturity of *Egges*, and some come to *perfection* sooner then their fellows. As is usually in the fruits of any *Tree*, whereof some are ripe, and ready to fall of themselves: whilst others are crude and greener, and cannot be shaken from the Boughs. So that some *Egges* are lesse forward the *fifth day*, then others the *third*. And (that I may instance in what I have found and tryed) I have found this true in very many *egges*, whom the *Hen* hath fostered the same length of time, and I have opened them all the same day. So that I have had no cause to quarrel against the weaker *Sex*, the distemper of the *Aire*, the neglect of the *Henne*, or any other Accident; but onely the innate weaknesse of the *Egge*; and the penury of the *ingenit Heat*.

*Ova Hyphenemia*, or *Addle Egges*, do at this time (as in a critical day) begin to alter and discover their *genius*: For as fruitful *Egges*, by the innate *plastick* vertue do alter and resolve into a *Colligamentum* (which doth after shift into bloud) so *Subventaneous Egges*, at the same time, begin to corrupt, and putrifie. And yet I have sometimes observed the *Macula* or *Cicatricula* to be distended wider even in *barren egges*; but it never rose up to the *top*, nor was ever circumscribed by the *circles* orderly drawn about it. I have also sometimes seen the *Yolk* grow clear, and liquifie, and the parts congealed, as it were, by rash, inconsiderate *coagulation*, float up and down like scattered *clouds*. And though these *Egges* cannot yet be called *corrupt*, *putrid*, and *unsavory*; yet they are very much prepared towards *putrefaction*, and do compleatly arrive thither, by the continuation of the warmth of the *Sitting-Henne*, and set out their *progresse* towards *corruption*, from the  
very



Ex. XVII. *The third Inspection of the Egge.* 97

very place and stage, whence prolificall Eggs advance to Generation.

The Perfecter sort of *Egges* therefore do now about the declension of the *fourth day*, acquire a twofold, or bipartite *Vesicula pulsans*, or vesicle of pulsation, one making answer and replies to the other by a double pulsation, in that Order and Method, that whilst one is contracted, the other shines and swells with blood; which presently being contracted, discharge it self of the blood that was in it; and in a moments time intervening, the former swells and returns the Pulse, so that you may evidently see, that the action of these vesicles is Contraction; by which the Blood is driven, and pumped into the vessels.

The *fourth day*, (saith Aldrovandus) the two *Puncta* were discovered, and each of them did move: pag. 217. which two points were without doubt the Heart and the Liver; which Viscera Aristotle saith are seen in the *Egges* after three days Incubation.

But Aristotle never said so, nor are those viscera usually to be seen before the tenth day. And I wonder Aldrovandus could think one of these *Puncta Pulsantia* was the Liver: as if the Liver ever had any such motion.

It is safer to believe that one of the *Puncta salientia* (when the *Fetus* enlargeth) doth constitute the *Auricula* or deaf Ears, and the other the *Ventriculi*, or *Ventricles* of the Heart. For in grown bodies, the *Ventricles* of the Heart are after this manner filled, and supplied by the *Auricula*, which by their *Systole*, are depleted and emptied againe: as we have observed in our *Tract, de Motu cordis & sanguinis*. In better grown *egges*, sometimes about the declining of the *fourth day*, I know not what cloudy substance did obscure these *Vesicula*  
H Pul-

*Pulsantes*, and did (like an interposed shade) obstruct my *Inspection*, that I could not so clearly discern the *Puncta salientia*. Yet by the help of a clearer light, and with a *Perspective*, and conferring with my *observations* for the subsequent days: it appeared to be the *Rudiment* of the *fetus*, or a *Cloud* exhaled from the *Colliquamentum*, or an *Effluuium* congealing about the *beginning* of the *veines*: as shall more at large be treated of in the *fifth days* observation.

*Aldrovandus* also seems to have observed it: The *fifth day*, (saith he) that *Punctum* which we called the *Heart*, did no longer appear to move outwardly, but seemed rather to be covered, and concealed; and the two *Meatus Venosi* were seen more conspicuous, but one larger then the other. But the Learned *Aldrovandus* is deceived, for this *Tutelar deity* taketh possession, and locks himself up in most reserved and secret recesses (when the habitation is almost compleatly erected) a long time after. And he likewise mistakes, where he saith, that by the innate vertue of the *veins*, the remaining portion of the *white* is turned into a kind of *straw-coloured substance*. For that complexion is in the thicker *white*, of all *egges* that are *stale*, and is daily increased in them, (namely, according as the *Egge* groweth *Staler*, as is said) and that without any assistance of *veins*, by reason of the thinner substance exhaling.

But the *Fetus* growing bigger, (as we shall declare in its place) and the *circles* of the *branches* of the *veins* being disseminated up and down, part of both the *juyces* are dissolved, not (as *Aldrovandus* would have it) by an innate vertue of the *veins*, but by the heat of the *blood* inhabiting there. For into what part soever of the *moistures* the

Ex. XVII. *The third inspection of the Egge.*

99

the foresaid *veins* extend their Territories, there presently appears a *colliquation* or resolution in the bordering parts; and therefore the *Yolk* at that time seems double, because its superior part (which is joined to the cavity above, about the *obtuse angle*) being more mollified, and dissolved then the rest of the *Yolk*, appears like melted *Wax*, compared to the other cold, compacted part. And upon that score (as all melted things do) it obtaineth a larger roome. And that *Upper part*, liquefied by the genital warmth, is disferminated from the other liquors (and especially from the *White*) by a peculiar most thin coat of its own. Whence it happens, that a breach being made upon this slender, frail, and invisible *membrane*, there presently follows a *confusion* and mixture of the *Yolk* and *White*, which disturbs the whole frame. And it is many times a cause to frustrate and void *Generation* (when those *liquors* become to be of a diverse, nay of a contrary nature) according to that Text in *Aristotle*, so often cited. *Egges are depraved and made* <sup>de gen. an. l. 3. c. 2.</sup> *addle most in hot weather, and that upon good reason.* For as *Wines* grow sower in hotter weather, the dregs being subverted (for that is the cause of their depravation) so *Egges* are destroyed, their *Yolk* being corrupted: for these are the more terrene and earthy parts in both. So that *Wine* is disturbed by a *confusion* of the dregs, and the *Egges* by diffusion of the *Yolk*. And hither you may justly reduce that of him too, where he saith, *Egges that are under the Henne in tempestuous thunders, are corrupted.* For the exceeding smal *membrane* is by so great a noise quickly torne asunder. And therefore perhaps, confused and putrid *Egges*, are called *Ova Cynosura*, because (as we have observed) it thunders <sup>Lib. 8. c. 3.</sup> *most in the Dog-days.* And therefore *Columella* rightly



rightly admonisheth, that most men deeme the Summer-Solstice to be inconvenient for hatching of chickens.

This is most certain, that Egges suffer quassation, concussion, and dissolution very easily, if any man disturb them while the Hen is Sitting, because at that time the liquors in them are liquefied, and swell, and the membranes embracing them are dilated, and grow tender.

### *The fourth Inspection of the Egge.*

#### EXERCIT. XVIII.

*Hist. an. l.  
6.c.3.*

**T**HE fifth day of Incubation, is discerned first (saith Aristotle) the body of the Pullus, being very small, and white, wherein the head is conspicuous, and in it the eyes much turgent, which continue so a long time, for it is long ere they abate, and connive. But in the lower part of the body, there is no part at first extant, correspondent to the upper. But those Branches which shoot out from the Heart, one tending to the ambient membrane, the other to the Yolk, do supply the office of the Navel. The original of the Chicken is therefore from the White, but its nourishment from the Yolk by the Navel.

By which words Aristotle seems to distribute the whole Generation of the Pullus into three classes, or orders, namely from the first day of Incubation, to the fifth; and thence, on to the tenth or fourteenth, and so on to the twentieth. As if he had onely recorded those things in his History, which he discovered at these three Inspections. The greatest changes

Ex. XVIII. *The fourth Inspection of the Egge.*

101

changes in the *Egge* do indeed happen at these times : as if by these *Decretory days*, as by three distinct degrees, the progresse of the perfect *Egge*, to the utmost exclusion of the *Chicken*, were distinguished. For the *fourth day* the first particle of the *Fætus*, namely the *Punctum saliens*, and the *Blood* appear ; and after that the *Fætus* is corporated. The *Seventh*, the *Chicken* is distinguished into parts, and begins to move. The *tenth* it begins to be down-feathered ; about the *twentieth*, it breathes, and cries according to its kind, and seeks to make its escape. The *Life* which it obtains about the *fourth day*, seems to emulate that of *Plants*, and is to be esteemed onely a *vegetative animation*. But from that to the *tenth*, it enjoyes a *sensative* and *moving soul* as *Animals* do : and after that, it is compleated by degrees, and being adorned with *Plumes*, *Bill*, *Clawes*, and other furniture, it hastens to get out, that being at length emancipated, it may be unconfined and free.

*Aristotle* therefore enumerates amongst those things which befall after the *fourth day*, chiefly three ; that is to say, the *fabrick* of the *body*, the *branchings* of the *veines*, which now supply the *Nature* and *Office* of the *Navel* : and the *matter* or *substance* whence the *Fætus* doth first spring, and is constituted, and nourished.

Concerning the *Fabrick* of the *Body*, he relates four things, *first*, what *magnitude* it is of ; *secondly*, what *complexion* ; *thirdly*, what parts are most *conspicuous*, (namely the *Head*, and *Eyes*) and *lastly*, what *distinction* or *difference* there is between the *Parts*. Truth is, the *Body* is exceeding small, resembling in form that common worm or Maggot, out of which the *Flie* is bred ; it is also white of colour, like that little Worm, which the

Flie depositeth in putrified flesh, to be cherished, and bred up; and he elegantly addes, *that it is most notorious from its Head and Eyes.* For that which first appears, is a *similar and indistinct Body*, as if it were some concrete and congealed substance of the *colliquamentum* it self (like that *Gelly* which is made of the decoction of *Harts horn*) being like a transparent cloud, which were hardly distinguishable, were it not divided as it were into two parts; whereof the *one* lies in a heap together; and is much larger then the *other*, being the *Rudiment* of the *Head*; which is first discerned on the *fifth day*: in which the *Eyes* are anon manifestly distinguished; which at first are the biggest of all, much puffed up, and prominent, and are discriminated both from the rest of the *Head*, and the whole *Body* besides, by a certain blackness cast round about them. Any one of *these*, is larger then the whole *Head*; as also, the *Head* alone exceeds all the rest of the *Body* in magnitude. This *Whiteness* of the *Body*, endureth a while, as also, the tumor of the *Eyes*: (which are filled also with a most clear moisture or water within, but are dark and blackish without, as it is also with the *Brain*) that is to say, to the *tenth day*, and more; for (saith *Aristotle*) *It is late ere they diminish, and contract to their allotted proportion.* Nay, according to my observation, the *Eyes* of *Birds* do never reduce themselves to the *Proportion*, which is allotted as the standard between the *Eyes* and the *Head* of a *Viviparous Animal*. For if you lay aside the *Skin*, which covereth the *Eyes* of a *Henne*, or any other *Bird*, either of them alone will soon countervail the whole bulk of the *Braine*: In a *Woodcock* and the like, any one of the *Eyes* is bigger then all the *Head* besides, (bating onely the *Bill*) but it is com-



Ex. XVIII. *The fourth inspection of the Egge.* 103

common to all *Birds* whatsoever to have the *Orbita*, or cavity which containes the *Eyes* to exceed the *Braine* it selfe, as you may see in their *cranium*, or *Scull*. But yet it falls out that their *Eyes* seem lesser, because they are all (except the *Sight* or *Apple* onely) shrouded with *Skin* and *Plumes*; nor are they of an *Orbicular Figure* (which might occasion their prominence or standing out) but of a *Depressed*, as *Fishes* eyes are.

In the lower part of the *Body* (saith *Aristotle*) there is no part extant at first, which is correspondent to the *Superior*: And so indeed it is: The *Body* at first were scarce discernable, were it not for the *Eyes* and the *Head*; so that downwards, it is not distinguished by any members at all, whether *Wings*, *Feet*, *Breast-bone*, *Rump*, or any *Viscus*: nor indeed is it graced with any *Shape* of a *Body*: but as far as I could discover, it is onely a *Little Substance*, next adjacent to the small *veins*, like the *carina* or *keele* of an imaginable small *Ship* wound up together, and like a *Maggot* or *Worme*, without any platform of *Ribbes*, *Legs*, or *Wings*: to which is fastned a little round body, which is the rudiment of the *Head*, which is more discernable then it, and divided into three *Bubbles*, (on which side soever you make your *Inspection*:) But it is indeed divided into *four*, whereof *two* are largest, and *blackish*, being the rudiments of the *Eyes*; the *third* of the *Braine*; and the *fourth* of the *cerebellum*, or *After-Braine*. All these are full of exceeding clear *Water*, but in the middle of the *Blackness* of the eyes, is the *Apple* or *Ball* of the *Eye* (as in the *Center*) shining like a transparent *Spark* or *Crystal*. Hence I suppose, the *Tres Bulle*, the three *Bubbles* which are onely conspicuous, have imposed upon those, who have not throughly observed the thing.

For having learnt, according to the old doctrine of the Schooles, that there were three *Principalities* in the *Animal Body*; and three *Principal Parts*; (namely, the *Braine*, the *Heart*, and the *Liver*) executing the chief *Functions*: They soon induced themselves to believe, that these *Three Bullæ* were the platformes, and ground-works of these three parts. But *Coiterus*, as becomes a skilful *Anatomist*, affirms much truer, that he saw, on the *Seventh day* after *Incubation*, the *Bill*, and the *Eyes*, but could discover none of the *Viscera*.

But to *Aristotle* againe. Those Branches, which proceed from the *Heart*, one of them tendeth to the circumambient membrane, the other to the *Yolk*, supplying the office of a *Navel*. The *Fetus* being now bodied, those *veines* do execute the office of a *Navel*: and one of their branches, or propagations is disseminated into the outward coat, which embraceth the *White*; but the sprouts of the other go directly to the coat of the *Yolk*, and are disseminated through its juyce or liquor. By which it is plaine and evident, that both the *Liquors* are dedicated to the nourishment of the *Fetus*. And though *Aristotle* say, that the *Original* of the chicken is from the *White*, and its nourishment from the *Yolk* by the *Navel*: Yet he doth not say that the chicken is made of the *White*; for the *Fetus* is made of that white Liquor which we call the *colliquamentum*: and all that which we call *Oculum Ovi*, the *Eye* of the *Egge*, is contained in the *White*. Nor doth he say that the sustenance of the *Chicken* is onely from the *Yolk* by the *Navel*: but I shall interpret his words (according to my one *Observations*) thus: Though the *Pullus* assume its original in the *White*, yet it is not fed by the *White* onely, but by the *Yolk* also

EX. XVIII. *The fourth Inspection of the Egge.*

105

also (to which one of the *Sprigs* of the *Umbilical veines* doth extend) nay chiefly by the *Tolk*; for the *White* (according to *Aristotle*) is the more concocted; and purer *liquor* of the *egge*, but the *Tolk* the more terrene, and solid, and therefore more congruous to the *Chicken*, when he is growne stronger: and therefore (as shall be said hereafter) it supplies the place of *Milk*; and is that which is last consumed; for the remainder of it (after the *Chicken* is hatched, and walkes abroad with the *Henne*) it yet contained in its *Belly*.

What I have hitherto spoken, cometh to passe, from the *fourth day* to the *seventh*. But *When*, *How*, and in *what Order*, all the *Particulars* are framed, I shall now explaine.

The *Next Appearance*, which presents it selfe the *fifth day*, about the *short veine* drawn from the *Angle* (where the *two points* leaping in course are seated) there appears a *grosser, and whiter substance*, like a little *cloud*, (which yet is transparent) through which the foresaid *veine* doth obscurely, and as through a *cloud*, cast a glimpse of it selfe. I have seen the same sometimes, in well grown *eggs*, upon the *fourth day*. But this is the *Rudiment* of the *Body*, which now every hour groweth more close, and compact, and doth encompassse the foresaid *veine*, and also is annexed to it, like a little *globous body*. That *globous Rudiment* doth much exceed the *Keele* (as I may call it) of this little *Worm*, in magnitude: and it is of a *triangular figure*, that is to say, (like the small sprout of a knotted *shrubbe*) obscurely divided into *three pieces*: Whereof one is *Orbicular*, and larger then the other two, and looks black, by reason of some most slender *fibres*, which are drawn from the



the *Circumference* towards the *Center*: resembling the platform of the *Septum Ciliare*, and therefore it implies, that this particle is transformed into the *Eye*. In the midsts of this, is a very little *Pupilla* or *Eye-Ball*, appearing like a most bright point: (as we have said) and upon that ground I raised my conjecture, that this entire little round body, was designed for the *Rudiment* of the *Head*: and that that black circle was to be one of the *Eyes*, to which the other standeth opposite on the other side: for they are so seated, that you cannot discern them both at once, because the uppermost covereth and hideth the lower.

This first *Rudiment* of the *Body*, which we affirm to grow about the *veine*, (hath obtained an oblong, and something an embowed figure, (like the Keel of a Ship; it is of a *mucous consistence*, like the film or hoariness which is contracted by moist things, when they are pent up in a close place. But the small *veine* to which this hoary substance doth accrew, is the descending *Vena Cava*, passing along the *Spine* of the *Back*: as my subsequent observations have cleared. If you diligently mind the order of the pulsation of the two *vesicles*, you shall discern the blood driven by the *Systole* of that which was last contracted into the beginning of this *veine*, and this vein distended by it.

So that there are two manifest *Contractions* and *Dilatations* of the two *vesicles* which cause a motion and pulse in one another: and the preceding *Contraction* of the one, creates the *Distention* of the other: for the blood being darted into the second *vesicle*, by the *Contraction* of the cavity of the first, causeth an *impletion*, *distention*, and *pulsation* in it: which by and by contracting it self, disgorgeth the blood (which it now received from the former vesicle)

Ex. XVIII. The fourth inspection of the Egge. 107

vesicle) into the beginning of the foresaid *veine*, and so dilateth that. I call it yet a *vein*, though by its *pulse* I conceive it to be the *Artery*, called *Aorta*; for the *Arteries* are not yet distinguished from the *veines* by the thickness of their coats.

Having often observed these things with much caution and circumspection in several *eggs*, I stood a while in suspense, what opinion I should entertain of them. As, whether I should conclude this concrete, and annexed *globous body* were made of the *Colliquamentum*, (in which it swam) as out of a compacted and coagulated substance; as *Clouds* are formed out of *vapours* in the upper Region of the *Air* (which vapors were never discovered to ascend:) Or else out of some *Effluvium* or exhalation of *blood* transpiring, or some *Transudation*, weeping by a kinde of *diapedesis*, from the *vein*. For the first *Rudiments* even of the greatest things, are exceeding small, and so very obscure, because very litle.

This, I presume, I am assured of, *viz.* that the *Puncta salientia*, the *Branchings* of the *veins*, & the *Vena cava* it self are first existent, & that afterwards this corpulency or *bulke* is joyned to them. And I am also most certain, that the *Blood* is driven into this *Vein* out of the *Punctum saliens*, and that by this *Vein* that litle *bulke* or *body* is fed. For that first *hoariness* or *Mucus* is first of all made by an *Effluvium* of the *Vein*, (to which it grows) and from it afterward draweth its nourishment and encrease: As *filme* and *hoariness* doth in other moist places grow between the *chinks* of *walls*, which lie long unswept; as *Camphyre* upon *Cedar-planks*, and *Moss* upon *Stones*, and *Barks* of *Trees*; or lastly, as a kinde of *downe* is bred upon some kinde of *Wormes*.

I did

*The fourth inspection of the Egge. Ex. XVIII.*

I did also doubt at the same time, whether this *Rudiment* of the *Head* and *Body* had its existence so soon, as the *coagulation* of the *Colliquamentum*, together with the *Blood*, and *Punctum saliens* had theirs, but was then imperceptible by reason of its thinness, and clearness of substance; till congealing into a grosser *film*, it put on a more solid, compacted *whiteness*, by which it might be discerned: while yet the *Blood* which is thicker and shining might be well perceived in the *Colliquamentum* which is so *diaphanous*. But whilest I consider the matter more narrowly, I am fully satisfied, that the *Blood* hath a *being*, before any other part of the *body* besides, and is the elder brother to all other parts of the *fetus*; and that from it, both the *matter* out of which the *fetus* is constituted, as also the *aliment* by which it is supplied, is desumed, and is (if any thing be) the first *genital particle*. But how I am induced to this perswasion, shall be afterwards copiously recited, when we discourse concerning the *primitive fructifying Part*, the *Innate Heat*, and *Radical Moisture*; and when also wee shall resolve what is to be thought concerning the *soule*, out of many *Observations* conferred together.

About *this time*, almost every hour, all things appear larger and clearer, and more distinct, and unfolded; and now there comes a nimble *Alteration* in the *Egge*, and many things appear one upon the neck of another. The *Cavity* of the *Egge* is now much larger, and layeth the upper part of it all void and empty, as if a fifth part of the *Egge* were vanished.

The little *branches* of the *Veins* are farther spread out, and grow more numerous in their *distributions*, not onely into the *Colliquamentum*, (as before)



Ex. XVIII. *The fourth inspection of the Egge.* 109

fore) but up and down both into *Yolke* and *White*, & both those *liquors* are chequered over with *fibers*. The upper part of the *Yolke* is much dissolved and melted, as if it were a distinct thing from the inferior, and that the *yolke* were now become two; the superiour shining like *melted wax*, swelled, and bright; and the inferior and earthier, together with the duller part of the *White*, being depressed to the *acute angle*. And the proper coat of the superiour part of the *yolke* is now so thinne, that the least *concussion* breaks it; upon which ensues a *confusion* of *liquors*, and an utter *frustration* of *generation*.

And now is the *first Rudiment* of the *Fetus* to be clearly seen (as you may perceive it in *Fabricius* his *fifth* and *sixth Tables*;) which being put into a *basin* of clear *water*, will plainly discover, what *parts* of the body are already framed, and what are yet wanting and behinde. For there appears the form of a small *Worm* or *Magot*, as we see the *rudiments* of *Wormes* and *Flies* in the *boughs* of *Trees*, in the *knots* of the *Bark*, in *Fruits*, *Flowers*, and other things; but especially in *Oak apples*, in whose *center*, within a small round *Shell* or *Kernel*, is contained a clear *liquor*, which thickning and coagulating by degrees, is interlaced with most slender *fibres*, and represents the shape of a *Magot*, but continues a while *immoveable*, till at length endued with *sense* and *motion*, it becomes an *animal*, and departs a *Flie*.

*Aristotle* describes a *Generation* like this, in *Hist. an. l.* those things that are called *Sponte nascentia*. Some *S. c. 19* creatures are born of the *Dew*, which falls upon the *Leaves*. And a while after he saies: *Butterflies* are made of *Worms*, but these *Worms* of green *Leaves*; and especially of the *Leaves* of that sort of *Raphanus*, which

110 *The fourth inspection of the Egge. Ex.XVIII.*

which some call *Brassica*. They are first smaller then *Miller*, and afterward very litle worms; then encreasing, within three dayes they become litle *Magots*; and after this being more grown, they cease to move, and changing their form, are called *CrySTALLIDES*, being contained in a hard crust; and if you touch them, they stirre: a great while after the crust or shell is broken, and so they being become winged creatures, take their flight, and are called *Butterflies*.

But we shall prove anon, that the Generation of all creatures is alike, and that all creatures, even perfect ones, are begotten of a *Worm*; which *Aristotle* also seemeth to have noted, where he saith: In all  
de gen.an.  
l.3.c.9.
*Creatures, even those which produce a perfect egge, the first conception groweth before it be distinguished: such is also the nature of the Worm.* Now this difference there is between the generation of the *Worm*, and other *Creatures*; that the *Worm* growes before hee have his shape, or distinction into parts: according to that of the Philosopher, *An animal is made out of a Worm, not as if it were made out of a part of it, as out of its Egge; but in that the whole Worm grows, and so becomes a dearticulate animal; namely, in growing it becomes to be jointed or distinguished.*

De hist.an.  
l.5.c.9.
 We have indeed cause to wonder, that the *Rudiments* of all *Creatures* whatsoever, especially of *Creatures* that have blood, (*viz.* of a *Dog*, a *Horse*, a *Deere*, an *Oxe*, a *Henne*, a *Viper*, nay of *Man* himselfe) should so exactly resemble the shape and consistence of a *Magot*, that you can perceive no difference at all.

Towards the end of the *Fifth day*, or the beginning of the *Sixth*, the *Head* is distinguished into three vesicles or litle bladders; whereof the first, and greatest, which is round, and blackish, is that of the *Eye*: in whose center the *Pupilla* is discovered.

Ex. XIX. *The fifth inspection of the Egge.*

III

red like a *crystalline Point*. Under this a lesser *vesicle*, whereof part is hidden, represents the *Brain*; to which the *third*, like a *crest* adjoynd, or a small round *knobb*, appears uppermost; of which at last the *Cerebellum* or *After-brain* is made: yet in all these you shall finde nothing, besides a cleare water.

And now the *Rudiment* of the *Body*, (which we call the *Keel*) doth more distinctly represent the *Spina dorsi*, or *Chine* of the *Back*: to which, *sides* begin to be built and appear; for the *Wings* and *Legs* do now jut out from the *Magot*. And the *vesels* do now plainly expresse the *Navel*.

---

*The fifth Inspection of the Egge.*

EXER. XIX.

THE sixth day the three *Bulla* of the *Head* doe more plainly appear, and the *coats* of the *eyes* are now distinct: also the *Legs* and *Wings* do bud forth; as at the end of *June*, the *Gyrini* (which the *Italians* call *Ravabottoli*, and we *Tadpoles*) begin to have *leggs*, when now they forsake the *waters*, loose their *tayl*, and put on the shape of *Frogs*.

The form of the *Chickens Rump* is yet no other, then that which is seen in all other *animals*, nay in very *vipers*, namely a round slender *tail*. The *Parenchyma* of the *heart* now groweth to the *vesicula pulsans*; and a litle after the *Rudiments* of the *Liver*, and *Lungs* are discovered, and also the *Bill*, all appearing exceeding *white*, especially the *Bill*. And about this time all the *Viscera* and the

*Guts*



*Guts* may be seen. But the *heart* exposeth it self first to sight, and the *Lungs* before the *Liver* or the *brain*. But before all are the *eyes* visible, because of their largeness and blackness of their colour.

And now the *fetus* moves, and gently tumbles, and stretcheth out the *neck*, though nothing of a *brain* be yet to be seen, but meerly a bright water shut up in a small *bladder*. And now it is a perfect *Magot*, differing onely from those kinde of *worms* in this, that those when they have their *freedom*, crawl up and down, and search for their living abroad : but this *worm* constant to his *station*, and swimming in his own *provision*, draws it in by his *Umbilical Vessels*.

The *Viscera* and the *Guts* being now erected, and the *fetus* being furnished with *motion* too ; yet the fore-part of the *Body* still lyes wide open, being deprived of the *Thorax*, and *Abdomen* ; and the *Heart* it selfe, the *Liver*, and the *Guts* hanging out.

About the end of this *day*, and the beginning of the *seventh*, the *claws* are distinguished ; and the *fetus* begins to have the *Effigies* of a *Chicken*, it opens the *bill*, and kicks : lastly, all the parts are delineated, especially the *Eyes*. But the *Viscera* or *bowels* are yet so obscure, that *Coiterus* truly affirms, That he saw indeed the *Eyes* and the *Bill*, but could discover no *Viscus* at all, though never so concealed or confused.

That which followeth from the beginning of the *sixth day* to the end of the *seventh*, cometh to pass sooner in some, and in some eggs later. Now are the *coats* of the *Eyes* seen, though they have nothing in them but a *liquid clear humor* : the *Eyes* themselves are something *prominent*, or *hanging out* of their *seats*, and each of them doth no less exceed

Ex.XIX. *The fifth inspection of the Egge.* 113

exceed the brain in magnitude, then the head, the rest of the body that is fastned to it.

A little bubble, like a cress, placed out of the circuit of the brain, supplies the place of the *cerebellum*, and that is also full of a clear water.

The brain seemeth obscurely divided, and shines not so much as the *cerebellum* doth, though it look whiter. And as the Heart is now to be seen without the inclosure of the chest, so is the *cerebellum*, out of the Confinnes of the *cerebrum*.

In cutting off the Head, I saw (by the benefit of my *Perspective*) in the Necke, a bloody speck of the *veine* which ascends to the braine. And by this means onely could I distinguish the rudiment of the *Spine*, from the other *Pulpe*, it was of a milkey complexion, but firmer consistence then milk. And so also like slender *cobwebs*, narrow white lines, wandering through the *pulp* of the body, to give some specimen of the *Ribbs*, and other bones; and this is much more discernable in the formation of other *Viviparous Animals*. The Heart, the Lungs, the Liver, and, instead of Guts, the most slender threads, were all white. The *Parenchyma* of the Liver grows to the *Umbilical vein*, there where it enters into the Liver, upon thin fibrous strings: in like manner as the Rudiment of the Body grows to the vein passing from the Heart, or to the *Vesicula pulsans*. For as Grapes grow to the cluster, buds to their stalks, and the eares of corn to the straw: So doth the Liver to the *Umbilical vessels*, like mushrooms out of Trees, or proud flesh in Ulcers, or fleshy tumors which border upon the branches of the Arteries, by which they are fed, and spread sometimes into a vast tumor.

Having had an Eye upon this emploiment of the Arteries, or circulation of the blood, I have sometimes

times perfectly cured exceeding great *Hernia car-  
nosa*, beyond all expectation; providing onely,  
that the *litle artery* being tyed or cut off, no nu-  
triment or spirit might have accessiō to the part  
affected; by which it fell out, that the *fatal tumor*  
was afterwards easily extirpated either by *incision*,  
or *adustion*.

A certain man, besides other infirmities, (and  
of this story I can produce many testimonies) had  
a *Sarcosis* or *fleshy tumor* in his *Scrotum* or *Cod*, big-  
ger then a mans *head*, hanging down to his *Knees*;  
and from it, another *Hernia carnosa*, as thick as  
ones *wrist* (or a *cable*) passed into his *Abdomen*, so  
that the disease growing to so great a height, no  
man would undertake the *Cure*, by *incision*, or o-  
therwise. Yet I perfectly cured this so vast excre-  
scence, which so much distended the *Scrotum*, and  
encompassed the *Testicle*, by the means aforesaid;  
and yet left the *leading and preparing vessel* to the  
use of the *Testicle*, without any prejudice or touch  
upon the other *vessels* descending into the *Scro-  
tum*, by the *Tunica vaginalis*, or coat of the *Testi-  
cles* so called. But these and other Cures, accom-  
plished clean beside the common opinion, I shall  
in my *Physical Observations* (if God grant me life)  
discover at large.

I mention these things with this intent, that  
men may plainly see, that the *Liver* grows to the  
*vessels*, and is generated some time after the *Blood*  
is born, and that its *parenchyma* is produced by the  
*Arteries*, (which administer matter to frame it)  
and also that for a while it continues *white*, and  
without *blood*; which is likewise common to o-  
ther parts of the *body*. For after the same manner  
and order, as we have declared the *production* of  
the *Chicken* to be out of the *Egge*, doth the *gene-  
ration*



**Ex.XIX. The fifth inspection of the Egge.** 115

*ration of Man, and all other Animals proceed.*

By which it appears, how incongruous their persuasion is, (though it hath obtained both of old, and now too) who decree the *Liver* to be both the shop where the *Blood* is wrought, and the *Author* of it; and do upon that account, rank it amongst the *chiefe* and *first-born parts* of the *Body*: who also give so much renown to this *Viscus*, that they proclaim it to spring with the *Heart*, from the first beginning, out of the *semen* of the *mother*; and do vigorously maintain the *Fable de tribus Capellis*, or the three imaginary Bubbles. In which *Quire*, *Parisanus* of late, with a loud, but unmannageable voice, hath sung his part of the *Catch*.

These honest men never took notice, that the *Vesicles* move, the *Heart* pants, & the *Blood* is now perfectly concocted, before any track or foundation of the *Liver* appears. Without all question the *Blood* is to be counted the *Author* of the *Liver*, rather than the *Liver* the *Author* of the *Blood*. For the *Liver* is made after the *Blood*, and of it, cleaving to the *Veins* that contain the *Blood*.

Nor yet can I subscribe to the *Aristotelians*, which repute the *Heart* to be the *Author* of the *Blood*. For its substance also, or *Parenchyma* is born after the *Blood*, and is then superadded to the *Vesicula Pulsantes*. But I am much in doubt whether the *Vesicula*, or *Punctum saliens* of the *Blood*, that is to say, whether the *contained liquor*, or the *containing vessels* be the elder. Now it seems in reason, that the *container* is made for the *contained*; and therefore after it. This indeed our eyes can truly witness, that the *Veines* are the first woof, and the first visible foundation of the body, and that all the other parts are superadded to them, and born after them. But of this matter hereafter more at large.

In the Interim we cannot chuse but smile at that fond and fictitious Division of the *Parts*, into *Spermatical*, and *Sanguineous*; as if any part were immediately framed of the *Semen*, and were not all of one extract and original.

But I return to our purpose. The extent of the *Colliquamentum* doth not reach over more then half the *Egge*. The *Heart* hanging out, stands something off from the *body*. And if you make a diligent Inspection, you may discover some of the *Umbilical Vessels* beat.

### *The sixth Inspection of the Egge.*

#### EXER. XX.

ON the *seventh day* all things are clearer, and the *primordia* of each particular part are now visible; namely, the *Wings*, *Leggs*, *Genitals*, the divided *Claws* of the feet, the *Thighs*, the *Sidesmen*, &c.

Now the *Fetus* bestirrs it self, and kicks, and the *Chicken* is found complete, there being no addition to be expected after, but only the growth of the parts yet tender: which the more they encrease, the more the *White* decays; and the outward membranes uniting, supply the place of the *Secundina*, or after-birth; as also the *Veines* do every day more and more represent the *Navel*. Therefore I conceive it convenient to pass from the *Seventh*, to the *Tenth day*, because nothing worth observation doth intervene in the mean time, though Authors usually, especially *Aristotle*, do not do so.

Not-

Ex. XXI. *The inspection after the tenth day.*

117

Notwithstanding all this, if you observe many Egges at a time, you shall finde some that are forward, and better grown, have all the parts apparent in them; other Truants will present them less distinct. Though on the other side, many things concur to the work, as the *Season of the year*, the *warmth of the Nest*, *Outward cherishings*, *Diligent Incubation*, and the like. I remember I have sometimes seen in a *sluggish Egge*, the *cavity* indeed dilated on the *seventh day*, and the *Colliquamentum* sprinkled ore with *veines*, also a *Magot* in the midst of it, together with the rudiments of the *Eyes*, and other things which come to pass in other *Egges*, about the fourth or fifth day; yet there were no *vesicule pulsantes* at all: nor could I finde the *Trunke* or root out of which the *Veines* rise. And therefore I justly counted it a feeble backward *Egge*, endowed but with a sickly generative power, and now upon the point to die. And that chiefly, because its *Colliquamentum* was more cleare and refulgent then usual, and the *veines* did also shine a litle. For when the *Vital spirit* departs, that part first declines and corrupts, which is first in order of *Generation*.

---

*The Inspection after the tenth day.*

EXER. XXI.

Whatever is visible the *tenth day*, is delivered so accurately by *Aristotle*, that litle or nothing remains to be added. And this opinion, according to my *Paraphrase*, is thus: *The tenth day*

I 3

all



all the Chicken is visible; and all pellucid, and white; save only the Eyes and divarications of the Veines. And the Head is bigger then all the rest of the body besides; and the Eyes stick fast in the Head, or rather stick to the Head as Appendixes, being yet unfurnished of a Pupilla or Eye-ball; (that is, having none yet perfectly formed; and yet it is no hard matter to discover the distinct coats or membranes) for if then you pluck them out, you shall finde them blacke, and bigger then Beanes; from which if you take off the skin, there flows a white, cold humour, very resulgent if you hold it in the light, and beside that humor, there is nothing (namely in the whole entire Head) contained at all. And this is the state of these parts, from the seventh day, to the tenth.

At the same time (saith Aristotle) the Viscera or Intrals also appear, and all the appurtenances belonging to the Belly and Guts; namely, the Parenchyma of the Heart, Lungs, and Liver, &c. but all are white, mucilaginous, and washy, and have no firm consistence in them. And the Veines also that proceed from the Heart, are applied to the Navel. And from the Navel one Vein passeth to the membrane containing the yolke; which is then more liquid and dissolved, then his natural constitution uses to be. But the other, to the other membrane, which containeth the whole membrane (namely the coat of the *Colliquamentum*) which encompasseth the Fetus, and the Yolke, and the interjacent humour. For while the Chicken grows by degrees, part of the yolke is above, and part below; but the White being in the midst, is liquid. And the white is also under that lower part of the yolke, as it was under it before. So farre Aristotle.

And now you may plainly see the Veines accompany the Arteries; as well those which tend to the Whites, as those which pass to the yolke. The  
yolke

yolke also now dissolves, and yet not all of it, but that which lyes uppermost : nor do the *springes* of the *Veines* run through the whole yolke, but through that part onely which we have said to be like melted wax. So also the *Veines* which tend to the White, have some *Arteries* for their companions. And the greater part of the White it selfe, is dissolved also into that white moisture (called the *Colliquamentum*) which surrounds the *Chicken* swimming in the midst of it, and lieth between the two divisions of the yolke; namely, the *Upper*, and the *Lower*: under which (in the *acute angle* of the *EGGE*) the grosser and more viscous part of the White remaineth. The Upper part of the yolke appears now more liquid and resolved, then the Inferiour doth; for wheresoever the *fibers* of the *Veines* disseminate themselves, the parts grow presently tumid, and softer.

But *Aristotle* adds, saying, the *White* at the tenth day sinketh down, being now grown less, viscous, thicker, and yellowish; namely that part of it which is not transformed into the *Colliquamentum*.

Now the greatest part of the *White* is resolved into the *Colliquamentum*, and the *Fetus*; that is, all the thinner part of the *Albumen*, and the greater part also of the thicker.

But the *Yolk* appears now larger, then it was at first. By which it is evident, that the *Yolk* doth not yet serve for *nutrition*, but is afterwards designed for that office. And as farre as I could conjecture, by the disseminations and distributions of the *Veines*, the *Fetus* is at first nourished by the *Colliquamentum*; for the *Veines* are first distributed into it alone, and thence into the membrane of the thinner *White*; and after that, into the grosser *White*, and *Yolk*: so that even the grosser *White*

becomes the nutriment, before the Yolk. For the most tender *Fetus*, whilest it is yet a small *Magot*, is fed with the thinnest diet of best concoction; that is, the *Colliquamentum*, and the thinner *White*. But when it grows more hearty, it is received with entertainment proper for its age and strength.

In the next words, *Aristotle* describes the situation of the particulars contained in the egge. At the upper and lower end of the egge, doth the membrane of the egge reside, not the membrane which belongeth to the shell, but under it: and in that membrane is contained the white liquor: (namely the *Colliquamentum*) then the *Chicken*, and the membrane containing it, which provides such a separation, that the *Fœtus* it selfe doth not wallow in the liquor.

Where I suspect a fault in the Text. For the thing it self speaks, that it should be rather thus. Then the *Chicken* encompassed in a *Membrane*, is seated, or swims in that white liquor; which *Membrane* is not that exterior one, which immediately lineth the shell, but another *Membrane*, lying under that: which when the exterior *White* is spent, and the remaining thicker *White* is depressed into the *Acute Angle*, of two *Membranes* (namely, that of the thinner *White*, and that which is proper to the *Colliquamentum*) is made one coat, which begins to appeare like the *Secundine*, called *Chorion*. Yet *Aristotle* saies well, In that *Membrane* is contained the white liquor: for by that he doth not understand the *Albumen*, but the *Colliquamentum* made of that *Albumen*, in which the *Fetus* swims; for the remainder of the *Albumen* is now sunk down into the *Acute Angle*.

The



The Inspection after the fourteenth day.

EXERCIT. XXII.

FROM the seventh to the fourteenth day, all parts are enlarged (as hath been said) and more visible. The Heart and all the other *Intrals* are now concealed in the several *Venters* or Bellies of the *Chicken*: and those that before were exposed, and naked, cannot now be seen, but by opening the *breast*, and lower *belly*. Now is the *Chicken* cloathed in *Plumes*, whose roots appear, like black points. The *Apple* of the *Eye* is now distinct, and the *Eye-lids* are plaine to be seen: likewise the *Membrana Nictatoria*, or membrane moving the *Eye-lid*, is visible in the greater *Canthus* or corner of the *Eye*, which is a membrane peculiar to all *birds*, by which they cleanse their *Eyes*. Also now the *Gyri* or *Involutions* of the *braine* are distinguished, and the *After-braine* is covered by the *Scull*: and the *Taile* hath attained the form of a *Rump*.

After the fourteenth day, the *Intrals* (which were white before) put on by degrees a ruddy flesh-colour. The Heart now entered into the cavernes of the *Chest*, and being guarded by the *Sternum*, or *Brest-bone*, enjoys the habitation which himselfe hath erected. The *Braine* and *After-braine* grow firm and solid in the *Arch* of the *Cranium* or *Scull*. But the *Guts* and *Gisard*, are not coneluded in the *Abdomen*, but hang out, being continued and fastned to the rest of the *Intrals*.

One

One of the two *Vessels* which are derived to the *Navel* from the *Belly* neer the *Fundament*, is an *Artery* (as the *Pulse* discovers) springing from the *Great Artery*: the other is a *Veine*, conveyed from the *Tolk* by the *Guts* into the *Vena Porta*, or *Gate-vein*, at the *concavous part* of the *Liver*: for the other *Trunck* of the *Umbilical vessels* having received its branches from the *White*, passeth by the *convex part* of the *Liver*, and is inserted into the *Vena Cava*, or *Hollow veine*, neer the *basis* of the *Heart*.

As these parts grow daily more conspicuous, so the greater portion of the *White* is daily consumed; but it is not so with the *Tolk*, which is hitherto almost entire, and of the same bulk it was the first day.

In the subsequent dayes, you may see the five *Umbilical vessels*, whereof one is a very large *veine*, arising from the *Hollow veine* above the *Liver*, and scattering branches into the *White*: the other two *veines* derived from the *Gate-veine* (having both the same original) are disseminated into the two parts of the *Tolk*; (which we have before described) and have two small *Arteries* which arise from the *Arteries* of the *loins*, accompanying them.

The *Chicken* doth now possesse a greater roome in the *egge*, then all the other things contained in it: and beginnes to be *down-feathered*; and the larger the *Chicken* growes, the more the *White* diminisheth. And it is worth the observation, that the *membrane* of the *Colliquamentum*, which wee have said is joyned with the outward coate, and with it doth constitute the *Secundine*, or *Chorion* doth now likewise containe all the *Tolk*, and being grown more contract, doth convey the *Tolk* together

XXII. Ex. XXII. The inspection after the 14<sup>th</sup> day. 123

together with the *Guts* to the *Fetus*, and fasten them to it, and shut them up like a purse, where the strings are drawn together. And though it was subtile, and transparent before, yet now as it growes more contract, so it thickens, and becomes more fleshy: and at length, like a *Hernia intestinalis* in the *scrotum* or *Cods* dilated, it covereth the *Guts* together with the *Yolk*, and sustaineth them all: till at last growing narrower by continuall contraction, it constitutes the *Abdomen* of the *Chicken*. You may finde the *Yolk* thus disposed between the *Guts*, the *belly* hanging looser about the 18 day: and yet not so fast rooted, but that the *Guts* (as it happeneth in the *Hernia intestinalis*) easily driven either backward into the *belly*, or downward into the *Scrotum*, may be moved up and down together with the *Yolk*. I have seen the *Yolk* in this manner fall from the *belly* of a *Pigeon*, which in the summer time, had too hastily broke loose from the *shell*.

About this time the *Chicken* hath a huge *belly*, as if it laboured of a *Hernia*. And now the *Colliquamentum* by degrees growes troubled and thicke, being altered, and diminished, (which was before in very great quantity) and the *Chicken* lies brooding upon the *Yolk*. And in those days, before the *Liver* attains a bloody complexion, or executes the office the second concoction (as they say) the *Gall* (which is separated by the virtue of the *Liver*, and is an excrement of that second concoction, as is commonly thought) is now to be seen, of a green colour between the *Lobes* of the *Liver*. In the *Cavity* of the *Stomack* there is a clear *Liquor*, having the very same consistence, colour and tast, with the *Colliquamentum*, in which the *Fetus* swam; which gliding down the *Guts* changeth its colour by



by degrees, and is converted into *Chyle*; and at last just such an *excrement* is discovered in the lower end of the *Guts*, as that which the *Chickens* eject after they are hatched. When the *Chickens* are more grown, you shall see the *liquor* concocted and coagulated in their *Stomack*: as in *Infants* that feed on *Milk*, there is a thick substance, which turns into *Whey* and *Curds*.

And now the *White* being almost spent, and a small quantity of the *Colliquamentum* remaining, the *Chicken* for some days before *exclusion*, doth no longer swim, (but as we have said) lies brooding upon the *Yolk*; and rousing himself up in a heap, his *Head* for the most part being nuzzled between his right *Legge* and *Wing*, he is compleatly accoutered with *Bill*, *Clawes*, *Plumes*, and other furniture. He sometimes *wakes*, and sometimes *sleepes*, and stirring himself, *respires* and *cries*. If you lay the *Egge* to your *Eare*, you shall plainly hear the *chicken* bustling, kicking out his *Legs*, and according to *Aristotle*, he will *stare* upon you, and in his manner cry and complaine. If you let it fall gently into *warne water*, it will swimme, and the *chicken* within it, being roused by the *ambient heat*, will bound and leap, and the *egge* (as is said) will tumble up and down. And this is the *experiment* which women make to prove the fruitful from the *barren eggs*, for the latter sink in the water. When the *White* is now clean consumed, a litle before *exclusion*, that other *Navel* (which as we said is derived to the *White*) is obliterated & expunged, or as *Aristotle* saith, that *Navel* which is extended to the exterior *Secundine*, is loosened from the *Animal*, and falls off. But that which is conveyed to the *Yolk*, is knit to the small gut of the *chicken*.

The

Ex.XXII. *The inspection after the 14<sup>th</sup> day* 125

The first Excrements that are found in the chick-<sup>Hist.an.l.6</sup>  
en, are white and muddy, like the egge-shell softened c. 3.  
and dissolved. And such also are to be found out  
of the *Fetus* wrapt up in the *Secundine*. To which  
*Aristotle* consents, saying, *At that time the Chick-*  
*en discharges much excrement to the outward mem-*  
*brane. And a white excrement is discoverable, not*  
*onely within, but without the belly.* But in proceſſe  
of time, when the exclusion of the *Fetus* approa-  
ches neerer, the excrement growes greenish, like  
that which the chicken ejects after exclusion. And  
you may also perceive in his craw, a part of the  
*Colliquamentum* swallowed down, and in his *Gi-*  
*sard* a schiston, or coagulated substance.

Nor is the complexion of the *Liver* hitherto ei-  
ther purple, or sanguine, but declining from white  
to yellow, as the *Livers* of *Fishes*, yet the *Lungs* are  
sanguine.

The *Yolk* is now concluded in the *Abdomen* be-  
tween the *Guts*: and that not onely while the  
chicken remaines in the egge, but also when he  
is excluded, when he walkes abroad with his  
Mother to seek his provision. By which it appears  
true, which *Aristotle* so often repeats: *That the*  
*yolk is intended for the Aliment of the Chicken*: for  
the yolk being shut up within him, the *Chicken* for  
the first dayes after exclusion (till his *Bill* is confir-  
med and strong enough to divide and prepare his  
meat, and his *Stomack* enabled to digest it) feeds  
upon it: so that it carrieth some analogy and pro-  
portion to milk. *Aristotle* casts in his suffrage with  
us, in the place so often recited. *Much of the yolk*<sup>Hist.an.l.</sup>  
*doth now lye under the Chicken: which yolk at last de-*  
*creases, and in proceſſe of time, is all turned into the*  
*chicken it selfe, in whose bowels it is contained: so*  
*that ten days after the chicken is excluded, if he be*  
*dis-*<sup>c. 3.</sup>

dissected, you shall finde even then some small remainder of the yolk adhering to his Intestines. Nay I have found some Reliques of the yolk after the thirtieth day. And, if the argument be of force from the production of the Umbilical veines (which we have shewed to be terminated in the *Vena Porta* of the Liver, by one or two Trunks) the Chicken is now nourished by Aliment attracted by the Umbilical vessels from the yolk: in the same manner as he afterward is sustained by the chyle drawn out of the Intestines by the Meseraike veins. For the vessels on both sides are terminated at the Gate of the Liver, whither they do alike convey the nourishment they draw; that we may not flie to the *Vena Lactea* in the Mesentery (which in feathered Creatures are no where to be found)

Give me leave to adde something here, which I have tried often; That I might the better discern the situation of the Fetus, and the Liquors after the fourteenth day, to the very exclusion: (the greater part of the White being now exhausted, and the yolk divided) I have boiled an egge till it grew hard, and then pilling away the shell, and seeing the Scituation of the Chicken, I found both the remaining part of the White, and the two parts of the yolk (which as we have said before, are divided by colliquation caused by the gentle warmth) of the same consistence, colour, tast, and other accidents, as any other stale egge, thus ordered, is. And upon this Experiment, I did much ponder whence it should come to passe, that Improlificall Eggs should, from the adventitious heat of a Sitting Henne, putrifie, and stink; and yet no such inconvenience befall the Prolificall: But both their Liquors (though there be a Chicken in them too, and he also with some Pollution and Excrement) should



Ex. XXIII. Of the Exclusion, or Birth, &c. 127

should be sound, wholesome, and incorrupt; so that if you eat them in the dark after they are boyled, you cannot distinguish them from *egges* that are so prepared, which have never undergone the *Hens incubation*.

Of the Exclusion, or Birth of the Chicken out of the Egge.

EXERCIT. XXIII.

THE *Egge* is (as we have said) a kind of an exposed *Womb*, and placed where the *Fetus* is formed: for it executes the office of the *Matrix*, and shelters the *Chicken* till its just time of *Birth*: who when he is perfect, is born from thence. *Oviparous creatures* are therefore not distinguished from *Viviparous*, in this, that these bring forth their *Fetus* alive, but they do not; (for the *Chicken* in the *Egge* doth not onely live and move, but doth breath also, and exercise a voice, and being born, enjoys a perfecter life, then the issues of other *Animals*) but their maine difference consists in the *manner of Generation*; namely, in that *Viviparous creatures* continue their *Womb* within them, in which the *Fetus* is fashioned, cherished, and compleated: but *Oviparous* expose their *Egge* or *Matrix* without: yet nevertheless they do ripen and cherish it as much by *Incubation*, as if they did reserve it within their bowels.

For though the *Mother* do sometimes upon sundry occasions desert the *Egges*, yet her affection  
con-

continues still with them, and making speedy returns, she receives them in her tender bosom, fostereth, and diligently defends them.

But when the *Chicken* now covets the *freer aire*, the *Shell* being parted, he entereth into the *world*, and this about the *one and twentieth*, or *two and twentieth day*.

pag. 55.

The *Common mistake* of *Fabricius*, and almost all others, concerning this *Exclusion* or *Nativity* of the *Chicken*, must not be passed by. Read *Fabricius* himself: *The Chicken* (saith he) doth want the *free aire* before it wants meat, because there is yet some aliment residing within it: in which condition the *Chicken* being unable to break the *shell*, in regard the *shell* is hard, and his bill soft, and also by reason of the distance between them, his bill being sheltered under his wing, he gives his mother a *signe*, by which he signifies the necessity he stands in to have it broke up, and this *signe* he uttereth by his cry. For the *Chicken* is at that time so lusty, and the cavity so enlarged, and so great a quantity of air contained within it, that his respirations being large, can send forth an exsufflation, and cry proper to his kinde, and probably such a one as doth express his request; which also the standers by may easily heare: and this do both *Pliny* and *Aristotle* mutually affirm. Which clamour of the *Chicken* comming to the *Hennes* eare, and she finding a necessity of breaking the *shell*, that her darling may enjoy the *fresh aire* to continue its life; or, if you will, she being affected with a strong desire to see her beloved *Infant*, breaks up the *egge* with her bill; which is no hard matter to do, since in that place, by reason the cavity hath been long destitute of liquor, and hath been much dried by the *aire* within it, and the heat without it, the *shell* is become more fraile, and brittle. The cry therefore of the *Chicken*, is the first and greatest token of its desire

Lib. 10. c.  
53. de Hist.  
an. l. 6. c. 3.

Ex. XXIII. The inspection after the 14<sup>th</sup> day. 129

desire of enlargement, and of the exigence it stands in for want of Air: Which the Henne so exactly understands, that if it so fall out, that she perceive the Chickens cry to be low, and inward, then she turns the egge up side-down with her feet; that she may cleave the egge just in that place from whence the voice comes, without any injury to the chicken. Hippocrates ad- L. de nat. deth another token of the Chickens inclination to get out puer. of the shell; namely, that the Chicken being now straitened for want of sustenance, bestirres himself strongly, in quest of better feeding; and that the Membranes are now every where torne asunder; and that the Mother discovering these violent Motions of her young, by scratching holes in the Shell, delivers it from bondage.

Thus far Fabricius, pleasantly and elegantly: but his arguments are not well bottomed. For I have found by Experience, that the Chicken it self (and not the Henne) doth break up the Shell: and this is also most consonant to Reason. For how could the egges which are fostered in Stoves and Ovens (as it is in Ægypt and elsewhere) be otherwise broken up? Where there is no Mother to pity the distressed supplicants, nor redresse their sufferings. And so how can the egges of your Land and Sea-Tortises, your fishes, silkwormes, vipers, and Ostriches be unlockt, when either the Issues themselves are mute and silent, or else lye hid underground, quite out of hearing. Chickens therefore are born by themselves, and break loose from their egges by their own industry. And this I can prove by infallible Arguments. For in the first perforation of the Shell, the gap is so litle, that it bears no proportion at all with the Bill of a Henne, but exactly answers the chickens; and round about the hole (in manner of a coronet)



the Shell stands up in splinters, being always pierced at the same distance from the top: and the shivered pieces (especially if the breach be new made) always jets out erect, and tufted. And as when *Glass-Windows* are broken, a man may easily discover whether they were burst from within, or without; if he do but take the paines to compare the bent and inclination of the fragments remaining: So also when the *egge* is pierced, by the erection of the splinters all along the circuit of the *Coronet*, it is manifest that the invasion came from within. And *I my self*, and many more with me, when we have heard the *Chicken* grate and scrape the Shell with his Claws, have presently seen it bored with his Bill, and a circular breach forced through it in the manner of a *coronet*. I have also seen the *chicken* bear up the top of the Shell with his *Head*, and so shake it off. We have been something large in this subject, because the *speculation* is not to be contemned: as will appear hereafter. But as for *Fabricius*, he is easily answered: For I grant the *chicken* hath a voice in the *Egge*, and perhaps a significant petitory voice: But it doth not thence follow that the *Henne* breaks the Shell, nor that the *chickens* Bill is so soft, and at so great a distance, that it cannot penetrate the Shell; especially since the Shell, according to his own arguments, is now very brittle. Nor doth the *chicken* alwayes confine his *Head* to his *Wing*, that so he may be made incapable of working his passage, but then only, when he is asleep, or else hath given up the *Ghost*. For sometimes, as *Fabricius* confesseth, he wakes, kicks, scrapes, scratches, straines the Shell, struggles, tears the *membranes* that enwrap him, cries, (and that he implores help by these cries, I

# EXER. XXIV. Of *Twinne-Egges*.

131

doe not withstand it) and all these *actions* may any man hear, that has a mind to it. Wherefore the *Hen* diligently listening, so soon as she discovers the voice to be remote, and come from below, she doth not burst the *egge*, but gently move it to and fro with her *foote*, till she have procured a more commodious *scituation* for the prisoner. Yet it doth no way appear, that the *Pullus* doth by his cry signifie the necessity of his release from the *Shell* to his *Mother*, or desire an enlargement of her procuring, for you may often times, even for two dayes together before *exclusion* hear him cry in the *Shell*. Nor doth the *Henne* by the several removes of the *egge*, seeke a convenient place to break it up : but as when the sick *Infant* in the *cradle* is disquiet, weepes, and roares, his affectionate *Mother* turnes him from side to side, and rocks him till he lye at ease : so likewise the *Hen*, when she finds her *chicken* busling, or crying in the *egge* : or after his *exclusion* tumbling up and down in a distempered posture : she presently starts up, and provides that the weight or heat of her body may not offend him, and moves him from place to place with her *Clawes* and *Bill*, till she have procured his ease and quier.

## Of *Twinne-Egges*.

### EXERCIT. XXIV.

They are called *Ova Gemellifica*, or *Twin-Egges*, de hist. an. l. 6. c. 2. which bring two *chickens* ; being (as *Aristotle* saith) Stocked with two yolks, which in some are divided

vided with a slender partition of White; to preserve them from confusion: but in others there is no White at all, but the yolks are contiguous.

I have often seen these *Ova Gemellifica* or *Twin-Egges*, where they have had two Whites to every yolk, together with common, and proper membranes respectively embracing them. And I have againe seen other egges where the two yolks did cleave to one another, and were both encompassed with one single Common White.

*Ibid.*

There are some Hennes (saith Aristotle) which bring none but *Twinne-Egges*, in which the Yolke is clearly disposed, as we said before: for a certain Henne in two and twenty egges, layed none but *Twinne-Egges*; except onely those that were barren. Now it comes to pass, that one of the Twins is bigger then the other: but the last is a Monster.

With us sometimes there are *Twin-Egges*, and the *Chickens* also are sometimes *Twins* too, though very seldome. And for my part I never saw two such *Chickens* that both of them lived: but one perished either in the egge it self, or in the *Exclusion*. And this also seems to have befallne *Aristotles Chickens*, because he saith, *One was bigger then the other*: implying that one of them was hartier then the other, and sooner quickned: but the other weaker, and so less ready to endure exclusion: For (I am perswaded that) the two Yolks are of different production, and maturity. And therefore it can hardly be, but that the forwarder *Chicken*, being now ripe for enlargement, in breaking up the egge, to make way for his own nativity, must needs induce abortion to his brother: And should he forbear to break up the egge, his own life were in imminent danger, being now freightned for breath. So that in *Exclusion*, the

one



EXER. XXIV. Of *Twinne-Egges*.

133

one or the other, receives their inevitable doome.

*Fabricius* either not observing, or not understanding those words of *Aristotle*, saith: If there chance to be such an egge that hath two yolks in it, the *Chicken* that is produced thence, is born with four legs, and four wings, and two heads, and so becomes a kind of Monster: but the *Chickens* never come forth so distinctly two: (as that they may truly be called two) but have onely one main Trunk of body, where two heads, and four legs and the like are adjoynd.

Whence it appears, that himself never saw, nor heard by others that had seen it, that such kind of *Egges* produce *Twins*: and therefore he must needs be of my mind; namely, that such *egges* rarely happen; and that they never exclude two vitall *Fætuses*. Yet I cannot but admire that (if he saw this place of *Aristotle*) he should say, that such an egg doth never produce two distinct *Chickens*, but always a Monster: especially since he believes, that the *Fætus* is formed of the *Chalazæ*, as out of the subject Matter, and he could not but see four *chalazæ* in every *Gemellifical* Egge. I rather believe that when in a *Gemellifical* Egge there are two Yolkes concluded in the same White, and are so conjoynd together, that their *cicatricule*, while they are opened together, do constitute one Eye (which we call the *colliquamentum*) a Monster chicken may be then produced, having four Legs, two Heads, &c. because I can see nothing to hinder it; and such a one I suppose was bred of *Fabricius* his Egge.

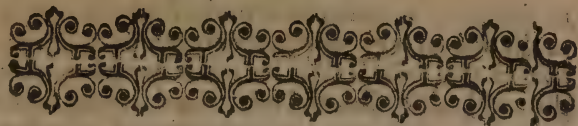
Yet nevertheless, where the two yolks are distinct, and separate by their proper Coats, and are furnished with their *Grandines*, and *Whites*, and other necessities conducing to the Generation

of the *Fætus*: I conceive we ought to conclude with *Aristotle*, that such an *egge* as it hath all the parts required to two *egges* (save only the Shells) so it obtaines the virtue and power too; and unless it be barren and addle, will for the most part produce two *chickens*, but seldom a single *Monster*.

---

CERTAIN

---



# CERTAIN THEOREMS

taken out of the foregoing History of the *Egge*.

## EXERCIT. XXV.

**T**He History of the *Hen-Egge*, is such as hath been said. Wherein we have delivered how the *Egge* it selfe is generated, and how by its *Action* (which is *Propagation*) it formeth the *chicken*.

All which, hath perhaps been sufficiently prolix, and tedious to such who are not yet acquainted, whither these so great undertakings, and so exact and accurate Observations, tend. And therefore I hold it convenient to discover what fruit and advantage may be reaped by my labour: and hereupon (to use the expression of our most learned *Verulamius*) we shall proceed to our *Second Vintage*: collecting certain *Theorems* out of our former History; some of which are Infallibly True, some Doubtful, and must submit to a farther Discussion: Some are Paradoxical, and contrary to the received opinion: Some of them also relate



to the *Cock*, or Male, some to the Female; some, to the Egge it self; and lastly, some to the *Formation* of the *Pullus*. Which when we have once thoroughly discussed, and understood, Our knowledge and insight into the *Generation* of all other *Animals*, will be lesse exposed to difficulty, and Errour.

### What an Egge is.

#### EXERCIT. XXVI.

**T**He *Theorems*, which are employed about the Contemplation of the Egge, some do teach what an Egge is, some what its *Generation*, and others what *Parts* go to its *Constitution*.

One Chick-  
ken pro-  
ceeds but  
from One  
Egge.

And first it is evident, that One *Chicken* proceeds but from one *Egge*: which though it be, a kind of an exposed *Womb*, yet it seldome produces more *Chickens* then One. And though sometimes it produce two, yet that *egge* is not to be accounted a *single*, but a *double egge*; as having obtained both the Nature and Parts of two *eggs*.

An egge  
is a Con-  
ception.

For the *egge* is a certain Conception proceeding from Male and Female, qualified with the power of both: and out of it being One, one *Animal* is constituted.

Both the  
Beginning  
and the  
Fruit.

Nor is it the Beginning, but the Fruit also, and the End; Namely, the *Principium*, the Beginning or Principle of the Offspring, that is to be generated; but the *Fructus*, the Fruit of Both Parents; namely, the *Cocks* and the *Hens* Work (or *End*, which

which they proposed to themselves in *Generation*) and the *Original* of the future *fatus*. Now, the *Seed* and the *Fruit* (according to *Aristotle*) are distinguished from one another, under the notion of *Former*, and *Latter* : for the *Fruit* is that which is made out of another, and the *Seed* is that out of which another is made ; for otherwise they were both the same.

The *Egge* also seemes to be a kinde of *Medium* ; It is also not onely as it is the *Principium*, and the *Finis*, but a certain *Medium*. as it is the *Common* work or production of both *Sexes*, and compounded of both : which containing in it self the *Matter*, and the *Efficient* or *Operative Faculty*, it hath the power of both, by which it produceth a *Fatus* like to *One*, or the *Other*. It is also a *Medium*, or thing between an *Animate* and an *Inanimate* creature ; being neither absolutely impowered with life, nor absolutely without it. It is a *Mid-way* or *Passage* between the *Parents* and the *Children* ; between those that were, and those that are to come, and the very *Hinge* and *Center* about which the *Generation* of all the *Race* and *Family* of *Cocks* and *Hennes* doth move, and depend. It is the *Terminus à quo*, the *Point* or *Original* from which all the *Cocks* and *Hennes* in the world do arise and spring : and it is also the *Terminus ad quem*, the *Aim* and *End* proposed by nature, to which they direct themselves all their life long. By which it comes to pass, that all *Individuals*, while to supply their *Species* they beget their *Like*, do continue and perpetuate their duration. The *Egge* is at were the *Period* of this *Eternity* ; for it is hard to say, Whether the *Egge* be made for the *Chickens* sake, or the *Chicken* for the *Eggs*. Now, which of these two, namely the *Egge* or the *Henne*, have the priority in *Nature*, or *Time*, we shall now copiously handle, when we

come

De gen. an.  
l. 1. c. 18.

come to discourse of the *Generation* of all *Animals* in general.

It is also  
the Sper-  
ma.

The *Egge* also (which is chiefly to be noted) answers in proportion to the *Seeds* of *Plants*, and hath obtained the same qualifications with them, so that it may justly be stiled the *Sperma*, and *Semen*, or *Seed* of the *Hennes* (as also the *Seeds* of *Plants* may be rightly called *Ova Plantarum*, the *Plants Egges*) not onely *ex quo*, out of which, as out of a *subject Matter*; but also *à quo*, by which, as by an *Efficient cause*, the *Chicken* springs. In which also there is no part of the *Future Fetus*, actually in it, but yet all the parts of it are in it *potentially*.

Ibid.  
The dif-  
ference  
between  
*Sperma* &  
*Genitura*.

Now, *Semen*, or *Seed* properly so called, doth differ from *Genitura*, *Geniture*, becaute (according to *Aristotles* definition) *That is called Genitura, which proceeding from the Male-Parent, is the chiefe and principle cause of Generation*; namely, in such as nature hath designed to coition; but the *semen* is that, which proceeds from both *Parents* in the act of coition; & the *Seed* of all *Plants* is like to this, and so is the *Seed* of some *Animals*, which have no distinction of *Sex* at all, being as it were at the first a kind of mixture of both *Sexes*, or promiscuous conception, or *Animal*: for those kind of creatures have in their single selves, as much as is required of both *Sexes*.

An *Egge* therefore is a *Natural Body* endowed with an *Animal power*: namely, with a *Principle* of *Motion*, *Transmutation*, *Rest*, and *Conservation*. And lastly, it is such a thing, as all impediments being removed, it will passe into an *Animal*: nor do heavy bodies, when all obstacles are out of their way, tend downward more naturally; then *Seed*, and the *egge*, do by an inbred *Natural Propensity* incline to become a *Plant*, or an *Animal*. And the *Seed* also, and the *Egge*, are the *Fruit* and



and End, of that very thing, whose Beginning and Efficient they are.

Of One Chicken there is but One Egge: So Aristotle, Of One Seed is begotten One Body; as for example, of One Graine of Wheat, One Eare; of One Egge, one Animal; for a Twinne-egge is Two Eggs. Gen. an. l. 1. c. 20.

And so Fabricius saith, Truly: An egge is not onely an exposed Uterus, and place of Generation, but the very thing also on which the entire Generation of the Chicken depends; which the egge accomplisheth, both as Agent, as Matter, as the Place, as the Instrument, and all other things, whatsoever are necessary requisites to Generation. He proves it to be an Organum, or Instrument, because it consists of several parts, and that according to Galen, who requires this to the very being of an Instrument, that it be composed of divers particles, which conspire all to one Action, but under several capacities, and for several uses; for some of these parts are the chiefe Agent in the Action; some are necessary Assistants, without which the Action could not be performed at all; others conduce to the more convenient & better performance; and lastly, some againe, to the wellfare and preservation of all the rest. And he also proves it to be an Agent, where he propounds out of Aristotle and Galen, the two actions of the Egge; namely, the Generation, and Augmentation, and Nutrition of the Chicken. And lastly, he saith exceeding well, when he affirms, that in the Operations of Nature, the Artificer or Agent, the Instrument, and the Matter are one and the same thing: So the Liver is both the Efficient, and the Instrument of Sanguification: and so the other parts of the body: wherefore Aristotle was in the right, saying, It is hard to distinguish the Agents from the Instruments. In artificial Operations indeed the Agent and the Instrument are divided, as

pag. 47.

de gen. an. l. 2. c. 4.

the

l. de form.  
Fet.

Phys. l. 1.  
c. 1.

the Smith and his Hammer, the Painter and his Pen-  
cil. And the reason is rendered by Galen, because  
in artificial Operations, the Artificer is without the  
Work; but in Natural the Efficient cause is included  
in the Instruments, and received with intimacy into  
the very substance of the Organ. To which I adde  
those Perspicuous passages of Aristotle, Of things  
that are, some are caused by nature, and some by o-  
ther causes: by Nature do Animals, and their Parts,  
also Plants, and simple bodies, as the Earth, Fire, Air,  
and Water, consist: For these and the like, we say,  
are made by Nature. Now all these forenamed crea-  
tures seem to be differenced from those things which are  
not made by Nature. For all those things that are  
made by Nature, seem to have in themselves a Prin-  
ciple of Motion, and Rest; some in relation to place,  
some in relation to increase and diminution, and som,  
in relation to alteration. Now a Horse-Litter, and a  
Garment, and all such kinde of things, according to  
their severall notions, as farre forth as they are the pro-  
ducts of Art, they have no inbred principle of Muta-  
tion: but so far as it chanches, that they are framed  
of Stone, or Earth, or bodies composed of these, so far  
they have one. As if Nature were a certain principle  
and cause, why that thing doth move, and rest, in  
which it first is, of it self, and not by Accident. Now  
I say, not by Accident; because it may come to passe  
that a man may be the cause of his own health, in case  
he be a Physitian: Yet he is not in health under the  
same Respect, as he is a Physitian; but it is a meer  
Accident, that the same Man should be in Health, and  
a Physitian too. And therefore these two things are some-  
times apart. And thus it is in all other artificial  
things: for none of them have in themselves an Efficient  
Principle, but some of them have such a Principle in  
others, that are without themselves, as a House and  
all

all other Manual Productions: some indeed have it in themselves, but not by themselves: namely, all those things which may by accident become causes to themselves. Nature therefore is that thing which she hath already been said to be. And all those things have Nature in them, which have such a kind of Principle. And all those things are substances. For Nature is ever some subject, and in some subject.

We have related these Passages more at large, <sup>The Efficient Cause of Generation is in the Egge.</sup> and in their Authors own words; that so it may appear, that what we attribute to the egge, is really in it; namely, the Matter, the Organ, the Efficient Cause, Place, and what ever else is required to the Generation of the Pullus. And chiefly, for the clearing of some most difficult questions, as namely, which is, and what kind of Principle it is, from whence Motion and Generation do proceed? Also, by what Power the Seed doth act, according to Aristotle? And lastly, what it is that doth inspire and qualifie the Seed with its fecundity? (For Aristotle decrees, that Nature is the Principle of Motion and Rest, Innate in all bodies, and not Accidental.) Whether that which in the egge, is the Cause Efficient, and Principle of Generation, and of the Vegetative and Vital Operations, be some Innate thing in it, or something Added to it? And whether it be in it first, and by it selfe, as a kinde of Nature: or else by Accident, as the Physician is in the Cure? Whether it be some Inbred, or some Acquired power which doth transform the Egge into a Chicken; or nourish it when it was but begun in the Ovary, augmenting, and perfecting, also preserving it while it is not Sapon by the Henne.

Moreover, what it is that fructifies the egge, whether it be to be called the Soul? or a Part of the



the *Soul*? or some *faculty* of the *Soul*? or something that has a *Soul*? or an *Intellect*? or lastly the *Deity*? because it acts for some end, and disposes all things by *providence*, and inimitable *art*, and after an incomprehensible manner; and always provides what is best, both for the being, and well-being; as also for defence, and ornament. And this not only in a perfect egge which it fructifies, but even in a *subventaneous* one too, nourishing, augmenting, and preserving it. And doth not only supply and nourish the *yolk* in the *Vitellary*, but that very least speck (whence that proceeds) being of no greater magnitude then *Miller*, or *Mustard-seed*, which it feeds and enlarges; and at last invests it with the *White*, the *Chalaze*, the *Membranes*, and the *Shell*. For it is probable, that even an *Improlifical*, *barren* egge, by an innate and inbred principle (though it be contained in the *Bowels* of the *Hennue*, and adhere to her) doth feed, conserve, augment, alter, (in like manner as *Fishes* and *Frogs-egges*, which being exposed do grow, and are perfected) and transforme it self out of a small *Whelke* or speck into a *yolk*, and afterward take its journey from the *Ovary* to the *Uterus* (though it have no Connexion to the *Uterus*) and there inrobe it self in the *White*; and at last compleat it self with the *Membranes*, *Chalaze*, and *Shell*.

But be it what it will, which doth alike both in a *Subventaneous*, and in a *Fruitful*, equally produce the same effects, after the same manner, and from the same Causes or Principles; whether it be the same *Soul*, or the same Part of the *Soul*; in both it is very well worth our inquiry. Now in probability, the same things do spring from the same Causes.

Though

Though the *egge* while it is making, is contained within the *Henne*, and grows to its parent in the *Vitellary* by the *Pedunculus* or stalk, and is supplied from the *Hens* veins: yet may it not be said to be a *Part* of its mother, nor to take life and vegetation from her soul, but from its own proper power, and intrinsecal principle As *Mushrooms*, *Mistletoe*, and several kindes of *Moss* are bred out of *Trees*, (which though they adhere to the *Plant*, and are sustained by the same sap with its own blossomes, and leaves, yet are they not *Parts* of those *Trees*, nor are they called so. *Aristotle* to salve these doubts, allows a *Vegetative Soul* to be, even in the very *Subventaneous Egge*, where he saith, *Both Females, and all things that live, have a Vegetative soul, as hath been often said: Wherefore this Egge* (treating of a *Subventaneous egge*) *considered as the Conception of a Plant, is perfect, of an Animal, it is Imperfect.* And in another place he teacheth the same thing, enquiring: *After what manner are Subventaneous egges said to live? for they cannot be said to live as fruitful egges live: For then an Animal might be produced out of them. Nor are they in the condition of Wood, and Stones; because they perish by a kinde of corruption, as things that formerly did in some sort partake of life. It is certain therefore that they have some Potential soul: But what Soul is that? doubtlesse that Soul which they last enjoyed, which is a vegetable Soul; for this is indifferently in all Plants as well as Animals.*

Whether  
the *Egge*  
be a *Part*  
of the  
*Henne*?

de gen. an.  
l. 3. c.

de gen. an.  
l. 2. c. 4.

And yet the same soul is not in *Subventaneous Egges*, and in *fruitful*. For if so, A *Chicken* might alike be formed out of both. But how their Souls differ, and in what, *Aristotle* doth not sufficiently declare, in his enquiry, *Why all the parts of an egge are framed in a Subventaneous Egge, and*

yet

yet an *Animal* is not procreated thence ? Because (saith he) it is necessary it should have a *sensative soul*. As if in fruitful Egges there were a *sensative soul*, besides the *vegetative*. Unlessse you apprehend it thus, that the *Vegetative soul* is *Actually* in a fruitful egge, which contains in it a *sensative soul*, in *Potentiâ*; out of which afterwards an *Animal*, and the *sensative parts* of an *Animal* are produced. But this doth not sufficiently salve the scruple, nor release the mind involved in perplexities and doubts. For an Egge seems to be the true *Sperma* of an *Animal*, according to that of *Aristotle*. In those things that have life, and no distinction of Sexes, the Seed is a kind of Conception already. I call that a Conception (which bears proportion to Seed) which is the mixture of Male and Female; wherefore out of one Seed proceedeth one Body, v. g. out of one egge one *Animal*.

de gen. an.  
l. 1. c. 20.

What  
soul is  
that  
where-  
with the  
Egges in-  
formed.

One egge therefore seemes to have one Soul: now whether is that Soul the soul of the *Henne*? or of the *Cock*? or a mixt soul of Both? For the doubt chiefly concerns those egges, which proceed from *Animals* of a distinct kind: as out of a dunghil *Henne*, and a *Cock Pheasant*. I enquire whether such an egge participate of the soul of the *Henne*, or of the *Pheasant*? or is the soul of the Egge compounded of them both? But how can there be a commixture of souls, if (according to *Aristotle*) the soul (as being the form) be an *Act*, and a *Substance*. For no man can deny, but that that thing whatsoever it be, which is the Principle and Cause of those Effects which we see produced in a *Fertile Egge*, is a substance susceptible of divers powers, forces, and faculties, as also of several conditions, vertues, vices, health, and sicknesse. For some Egges are longer lived then others: and some do

pro-



procreate *Chickens* endowed with the vertues, and soundnesse of constitution of the parents; and others produce them inclinable to distempers. Nor can we for this inconvenience accuse the Matter, out of which they are generated, since the diseases of the Male are sometimes transferred to the *Chickens*; who is not concerned any thing at all in the Matter of the egge. For from the Male the *Plastical* and *Generative* faculty onely doth proceed, which renders the egge fertile, but doth constitute no part of it. For the *Geniture* which is emitted from the Male in *Coition*, doth not enter into the *Matrix*: (where the *Egge* is formed) Nor (as we have said before, and *Fabricius* also joynes in the Suffrage) can it any way penetrate those recesses, and much lesse the *Ovary*, which is seated neer the *Precincture*, or *Midriffe* of the body, that so it might communicate any portion of the Matter, or any thing at all besides its single Vertue. For constant experience testifies, that one and the same act of *Coition* doth fructifie many *egges* together: and not onely those that are existent in the *Uterus* and the *Ovary*; but those also that are not yet begun: as we shall declare hereafter, and have already proved in our History.

If therefore the *Egge* be rendered *Fertile* from its own proper soul, or be endowed with an innate fructifying principle of its own; by which either a *dunghil Chicken*, or a mongrel-issue between the *dunghil-Henne*, and the *Cock-Pheasant* doth arise; and that either *Male*, or *Female*, like the *Male*, or *Female-Parent*; sound, or sickly; we must then conclude, that the *Egge* (even while it is contained in the *Ovary*) doth not live by the *Soul* of the *Henne*; but is a freeborn, Independant Issue from its very first original: As the *Acorns* taken off from

The *Egge*  
doth not  
live by  
the *Soul*  
of the  
*Henne*.

the *Tree*, and the *Seed* from the *Plant*, are no longer to be counted parts of them; but creatures, as it were, at their own dispose; living and subsisting, by an inbred vegetative faculty peculiarly their own.

Now if we affirm that a *Fertile Egge* hath a soul, a question will arise; whether that self-same soul, be now at present in the *Egge*, and how after in the *Chicken*, or whether their souls be distinct. For we must of necessity acknowledge, that some Principle there is which doth constitute, and nourish the *egge*; and also that there is a Principle which produceth and sustaineth the *Chicken*. The question therefore is, whether the Principle, or soul of the *Egge* and *Chicken*, be one and the same, or more then one, and diverse? For if there be more then one soul; (namely, one which belongs to the *Egge*, and another to the *Chicken*) it will be farther enquired, whence, and at what time the *Chickens* soul arrives to it? And what that is in the *Egge*, which dilates the *Cicatricula*, raises the *Yolk* to the top, and produces that *Eye*, (which we call the *Colliquamentum*) alters the Constitution of the liquors, and doth predispose all things for the fabrick and structure of the *Chicken*, when as yet there is nothing at all of the *chicken* existent? Whence also can we pretend that proper and convenient Aliment is derived to the *Chicken*, to sustain and augment it, when there is yet no *Chicken* at all? For these operations seem to belong to the *Vegetative soul* of the *Chicken*, because they relate to the *Chickens* use; namely, its *nutrition*, and *Augmentation*. But now, when the fabrick of the *Chicken* is in hand, and half-perfected, what is it that makes the *Fetus*, One and the same thing with the Liquors, conjoining them

together by continuity, and concrescence? What is it that feeds, and enlarges the *Pullus*; that doth vindicate those juices which are advantageous to its nourishment from Putrefaction, preparing, melting down, and concocting them?

Since the *soul* is the *Act* of an *Organical Body*, which hath life in *Potentiâ*, it is an incredible thing that that *soul* should be in the *Chicken* before its body have received any *Organization*. Nor yet can we believe that the *soul* of the *egge*, & the *chicken* is one and the same: for the *soul* is the *Preserver* of that thing only, whose *soul* it is; but the *Pullus* and the *Egge*, are two distinct things; and do exercise not only *distinct* vital operations, but *Contrary*; in so much that one of them seems to result from the *Corruption* of the other. May we then say, that the *Cause* and *Principle* of life to them both is one and the same? namely to the *Chicken* which is yet but an *Embryo*, and to the rest of the *Egge*, as if it were the simple and single act of one and the same body; or as if out of the parts constituting one natural body, one *soul* did spring, which were *all in the whole* (as they say) and *all in every Part*. As we finde in the *Trunk*, *Leaves*, and *Fruit of a Tree*; in which, wheresoever we make a separation or division (be it in what part it will) wee say, that the first *Cause* and *Principle* of that part, is the same with that of the *Whole*, as being the *Form* and *End* of the *One*, but the *Principle* only of the *Other*. For so in a *Line*, in what point soever a division be made, it will be the *End* of the *Fore-going* part, but the *Beginning* of the subsequent. And the same thing may seem to befall in *Quality*, and *Motion*; namely, in every *Transmutation*, and *Generation*.

And so much at present concerning these mat-



ters: which we shall more exactly, and more copiously handle, when we treat in General of the Nature of the Soul of the Fetus, of any Animal whatsoever; as also what it is? From whence, and when it comes? What part it takes first possession of? and how it is all in the Whole, and all in every part? And also how it is the same, and yet diverse? All which we shall determine and resolve out of multiplied experiments.

*That the Egge is not the Production  
of the Womb, but of the Soul.*

EXER. XXVII.

pag. 8.

**A**S we conclude (saith Fabricius) the Action of the Stomack to be Chylification; and the action of the Testicles to be the Generation of Seed; because the Chyle is found in the Stomack, and Seed in the Testicles: So we positively resolve, that the Generation of Egges is the action of the Uterus of the Fowle, because the egge is found resident there. So then wee evidently know, and understand, which is the Instrument and Place of the Generation of Egges. But now againe, since there are two Wombs in a Fowle, the Superior and Inferiör, and those much unlike one another, and therefore their Actions are divers, yet is it apparent which action is peculiar to each. For the Superior is ordained for the Generation of the Yolk, the Inferiör of the White, and the other parts, or of the whole, as is evident even to sense: For in the Superior nothing is contained but a throng of Yolks, but in  
the

the Inferior the entire perfect egge. And yet this is not all the employment of the Womb; but the Augmentation of the egge, which presently insueth after the egge is generated, and continueth till it be compleated and have attained its just stature or magnitude, is also im-  
plied herein. For a Hen doth not naturally lay her egge till it be perfect, and have its just proportion. The Action therefore of the Womb, is both the Generation and Augmentation of the Egge. Now Augmentation includeth and supposeth Nutrition. But since all Generation is effected by two; namely, the Agent, and the Matter: The Agent in the procreation of Egges is nothing else, but the Instrument or proposed Organs, namely the twofold Uterus. But the Matter is nothing else but Blood.

Now we, though we acknowledge the Action of the Uterus to be in some sort the Generation of the Egge, yet we do not agree upon any termes in the world, that the Egge is nourished and encreased by the Uterus. And this both for the reasons before alledged, when we discoursed concerning the soul of the Egge, which nourisheth it: and also because it is an improbable thing, that an External Agent (as the Womb is, in regard of the Egge) shou'd form, nourish, and augment all the interior parts of the Egge, according to their several dimensions: nay according to Aristotle, it is altogether impossible. For how can an agent that is extrinsecal in respect of the patient, work upon the Aliment that is elsewhere provided, and restore it into the place of that which is wasted away, according to all dimensions; or how can any thing be affected and altered by that, which doth not touch it? Therefore doubtlesse the same things befall the Generation of Egges, as happen to the exordiums of all living creatures; namely, that they

de gen. an.  
l. 2. c. 1.

150. *That the egg is not the production* Ex. XXVII.

should be constituted by some preexistent external thing; but presently (upon the reception of life) nourish, and augment themselves; and that by a proper inspired efficacy, proceeding from a Principle which is now borne, and implanted in them.

What we have lately delivered concerning the soul, doth seem to evince clearly, that the *Egge* is neither the Workmanship of the *Uterus*, nor controuled or governed by it: For it is apparent that even a *Subventaneous* *egge* is furnished with a Vegetative Soul, because we discover even such an *egge* also to enjoy Vegetation, Nutrition, Augmentation, and Conservation, which are infallible signs of the fore-said Soul. Now these faculties cannot issue out of the *Mother*, or *Matrix*, because the *Egge* hath no Coherence, or Union to it; but tumbles and roules in its Cavity free, and disjoyned (like a Son who hath obtained his Freedom) and growes up to perfection, as the Seeds of Plants do in the *Womb* of the *Earth*, by an internal Vegetative Principle, which can be no lesse then a *Vegetative Soul*.

Much more will it appear, that it hath a Soul, when we consider, after what manner, and by whose impulsion, the Round and Ample *Yolk*, being now loose from the *Vitellary*, maketh its descent through the *Infundibulum*, (which is a slender Tunnel, wrought with a most thin membrane, which hath no provision of motory fibres) working out its own way, till through all those freights it arrive at the *Uterus*; where it nourisheth, augmenteth, and invests it self in the *White*. And yet all this while, there is no *Motory Instrument* at all in the *Vitellary*, which should expell it thence, nor in the *Infundibulum*, which should transmit it,



Ex. XXVII. of the Womb, but of the Soule. 151

it, or in the *Uterus* which should attract it: Nor is the *Egge* fastned by veins to the *Uterus*, as in the *Ovary*, nor hath any dependance upon it by the *Umbilical Vessels*; as *Fabricius* truly affirms, and is obvious to every eye. What then remains, but that upon discovery of such wonderful Operations, we should cry out with the Poet,

*Spiritus intus alit, totamque infusa per artus* 6. *Ænead.*  
*Mens agitat molem.*

An innate Spirit feeds, an Infus'd Soul  
Into each part, doth the whole Mass controul.

And though the first ground-workes of *Egges* (which we have proved to be but Whelkes, as it were, and of the magnitude of the Seed of *Millet*) do cohear to the *Vitellary* by the mediation of Veins and Arteries; (as the Seeds of Plants are born adhearing to the Plants) and thereupon seem to be Parts of the Henne, and to be nourished and live after the manner of other Parts: yet it is evident, that as the Seeds of Plants being dis-united from the Plants, are no more accounted parts of them; no more are *Egges*, now come to maturity, impowred with fertility, and separated from the *Vitellary*, any longer to be ranked amongst the Parts of the Henne, but like a Son come to age, and at his own dispose, are regulated and enliven'd by their own proper soul.

But of this more fully hereafter, when we shall discourse concerning the *Soul* of an *Embryo* in general; and of the excellence and divinity of the *Vegetative Soul*, ordering all things after a wonderful manner: (which providence, art, and divine discretion, as farre exceeding our capacity,

as God excells Man; and therefore are (confessed by all) truly admirable, not to be gazed upon by our cloudy apprehensions, by reason of their ineffable lustre.

What shall we say then of those little Animals, which are begotten in our own bodies, which no man ever doubted to be regulated and vegetated by their own proper soul? And of this kind are *Worms* in the *Stomack*, *Guts*, and *Fundament*, *Lice*, *Nittes*, little *Wormes* in the *Flesh*, *Mites*: Or what shall we resolve concerning those *Wormes*, which proceed from *Plants*, and their fruit? such as you may finde in *Galls*, *Nuts*, the *Scarlet-Berry*, and *Eglantine*, &c. For an *Animal* may be created almost in all drye things, growing moist, or moist things growing drye. It is impossible that those *Animals* which are bred in the *Galls* should be enlivened by the *Oke*s soul, though they live joyned to the *Oke*, and provide their Aliment out of the Sap of the *Oke*. And so it is credible, that the very Rudiments of the *Eggs*, while they are yet in the Cluster, do subsist by their own, and not by the *Hennes* Soul, though they are united to her by Veins and Arteries, and she also do administer nourishment to them. For (as we have observed in our History) the *Whelkes* do not all grow at once (as *Grapes* grow in the Bunch, and Graines in the Eare of Corne) as if they were inspired by the same concocting and formative faculty; but are increased one after another; (as by their own efficacie) and that which first separates its selfe from its fellowes, changeth colour and consistence, and of a White *Whelke* is made a *Tolke*; and so they follow one another in order: And which is more remarkable, in *Pigeons*, and some other *Birds*, they grow up from the Cluster in pairs

Hist. an. l.  
5. c. 32

Ex. XXVII. of the Womb, but of the Soule. 153

paire to make up one *Laying*; and one of them proves for the most part a *Cock*, and the other a *Henne*. And yet in the meane time some of the *Papula*, or *Whelks* in the *Ovary* stay at a stand, till two other grow up for a new production, which have received fecundity from the repeated coition of the *Male*, and are both inspired with a *Soule*. Which when they have received, they order themselves, and grow; living at their own, not at their Parents command. For indeed what can you fancie to dispose, select, separate, and perfect these *Papula*, or *Whelks* (rather then the other) unless it be their own proper soules. For though they assume nourishment from their Parent, yet they doe it no otherwise, then the *Plants* attract from the *Earth*, or the *Fetus* from the *Yolke* and *White*.

Lastly, because the *Papula* continuing in the *Ovary*, receives its fecundity from coition, and such a one too, that it by and by passeth into the forme of the *Cock* concerned in the coition; (whether it be *Dunghill-Cock*, or *Cock-Pheasant*) and since so great a difference befalls the *Papula*, as there is in the *males* themselves of different kinde, what shall we conclude to be in the *Papula* themselves, by whose virtue they are distinguished both from themselves, and their *female* parent? Doubtless it must needs be the *soule*, by which they are diversified both from one another, and from their Mothers also.

And just in this manner doe *Mushromes*, and *Plants* growing to *Trees*, live. We discover likewise often in our own bodies, that *Cancers*, *fleshy*, and also *phlegmatical Tumors*, and such like swellings, are supplied and fed as it were with their own proper *vegetative soules*; while in the interim

the



the true and genuine parts of the Body, doe extenuate and wither : And that because these tumors doe seduce all the aliment to themselves, and so defraud the rest of the body of its fostering juyce (as of its *Genius*) whence they are called *Phagedene* and *Lupi*, Devouring Cankers and Wolves. And perhaps *Hippocrates* by his *τὸ δεινόν*, understood those diseases, which spring from venom, or contagion ; as if they were furnished with a life, or inspired with a certain divine principle, by which they provide for themselves, and propagate their kinde, and so did beget by contagion distempers like themselves, in several persons. Wherefore (*Aristotle* saith) *Anima plena sunt omnia*, All things are filled with a soule. And in another place, he conceives that even Wind hath its life, birth, and decease. But the yalke, when it is now divorced from the Ovary, and spoiled of all commerce with the *Henne*, then doubtless (as *beanes* and such like pulse derive of their own accord humidity from the Earth, which they imbibe, and digest) passing through the *Infundibulum*, and residing now in the Cavity of the *Uterus*, it doth attract a slow thick moisture, which it receives into it selfe, and from it obtaineth nutrition and augmentation, begirts it selfe with the *White*, and being ingarrisoned in the membranes and the shell, is at last exact and perfect. All which being dæly considered, wee conclude, that it is stored with a peculiar soule of its owne.

De Gen.

an. l. 3. c.

II.

Ibid. l. 4. c.

II.

That the Egge is not made without  
a Henne.

EXERCIT. XXVIII.

TO omit what ever is in dispute ; and to wave  
all controversies till we come to the General  
contemplation concerning this subject; we now pro-  
ceed to things of more certainty, & more obvious.

And first it is manifest that an *Egge* cannot be  
made fertile, without the help of the *Cock* and  
*Henne*. For without a *Cock* it cannot be fruit-  
full, without a *Henne* it cannot be at all. And this  
is opposite to that opinion, which deduceth the  
first rise and fabrick of all living creatures out of  
the clay of the *Earth*. For since the several parts  
of *Generation* (namely the *Testicles* and *Leading*  
*Vessels* in the *Cock*) are formed with such eminent  
*Art*, *Industry*, and *Reason*, and likewise the *O-*  
*vary* and *Uterus* in the *Henne*, together with the  
*Veines* and *Arteries* which are subservient to them,  
are so skilfully composed, and the situation, fi-  
gure, and temper of every particular, are dispo-  
sed in a miraculous method; and all these things  
are some way or other required to the *generation*  
and *fecundity* of the *egge*: most certain it is (for  
*nature* makes nothing in vain, nor doth she go to  
work by digressions, where she may be more com-  
pendious in her dispatch) that an *egge* cannot be  
any other way produced, then now it is, (namely,  
by a *cock* & a *hen*) neither by *nature* of her own ac-  
cord, nor by any other means whatever; nor can ei-  
ther *cock* or *hen* be produced, but frō an *Egge*. So that  
the *cock* & the *hen* are made for the *Eggs* sake, and  
likewise the *Egge* for the *Cock* and *Hens* sake: and

you

you may be justly doubtfull with *Plutarch*, which of these is first, namely the *Egge*, or the *Henne*? For she was first in order of *Nature*, but the *Egge* in order of *Time*. For whatsoever excells, is first in order of *Nature*; but that from which another is produced, is first in order of *Time*. Or else we may say, That that *Egge* from which this or that particular *Henne* sprung, is of more Antiquity then the *Henne*: and so on the contrary, That *Henne* which produceth this particular *Egge*, is elder then it. For this Vicissitude and Circuite perpetuates the Race of *Cockes* and *Hennes*; while now the *Cbicken*, and now the *Egge* by a constant series and return do continue an Immortal *Species*, out of the decay and ruines of the *Individuals*. And after this sort do many *sublunary* creatures emulate and approach to the Perpetuity of *Celestial* bodies.

And whether we affirm a soul to be in the *egge* or not, yet by this circumvolution it appears, that there is some principle of the vicissitude from the *Henne* to the *Egge*, and again from the *Egge* to the *Henne*, which confers a sempiternity unto the n. And that very thing (saith *Aristotle*) beareth an Analogie to the substance of *Starres*; and causeth the Parents to propagate, and their seed, or eggs, to be prolificall: and is like *Proteus*, disguised in several formes, ever existent both in the Parents, and in the *Egges*. For as that Minde or Spirit which rules the world, doth continually reduce the same Rising and Setting *Sun* from several Quarters and Regions of the Earth: so also in the Progeny of *Cockes* and *Hennes*, the *Vis Enthea*, or divine Principle, which is now called the *Plastical*, sometimes the *Nutritive*, and sometimes the *Augmentative* Power or Virtue, is also ever conceived to be the

Conser-

de gen. an.  
l. 2. c. 3.



Conservative, and Vegetative too: and now putting on the form of the *egge*, and now of the *Chicken*, continues for ever. And though some *Animals* are born of their own Accord, or (as they commonly say) of *Putrefaction*: and others only produced from a *Female* (as *Pliny* notes in some kinde of *Lib. 9. c. 16.* living creatures there is no *Male* at all; as in the *Ruffles*, and the *Roches*: for they are all taken great with *spawn*) yet whatsoever is produced from a perfect *egge*, doth not proceed but from both *Sexes*.

And therefore, saith *Aristotle*, *The Male and the Female are chiefly to be counted the Principles of Generation.* *de gen. an. l. 1. c. 2.* The *Cock* therefore and the *Henne* are the two first *Principles* of the *egge*; the *fruit*, or common conception of both which is the *egge*, containing in it the virtue of both *Parents*. So that an *egge* can no more be made without the assistance of the *Cock* and *Henne*, then the *fruit* can be made without the *Trees* aid. And each particular *Individuum*, both *Cock* and *Henne*, seems to be created for the *egges* sake, that the same *Species* may be prolonged, though by the ruine and obsequies of the *Authors*. And it is also clear, that the *Parents* are no longer youthfull, beautifull, complete and *Jovial*, then they can generate, or fructifie their *eggs*, and produce their own like, by the mediation of those *eggs*. Which work of nature so soon as they have accomplished, as if then they had attained the highest *acme*, or Pitch of their perfection, and last end for which they were born, they presently wither, grow old, and *Emerit*, and as if *God* and *Nature* had forsaken them, they decline speedily, and hasten to their end, like creatures weary of their lives. Whereas on the contrary, the *Males* when they arm themselves, and are in all respects well

well appointed for Loves encounter, how strangely doth the potent *Cupid* heighten their enflamed spirits, how spruce are they, how do they pride it; how vigorous, how testy, are they, and prone to conflicts! But when this office and performance ceaseth: oh! how soon doth their force abate, and their late fury coole! how doe they hale in all their swelling sails, and check their darings? Nay even while this jocund *Sacrifice* to *Venus* is in season, no sooner is the act performed, but they grow tame and pusillanimous; as if it were then deep printed in their thoughts, that while they impart a life to others, they are in full career to their own urnes. Onely our *Cock*, full fraught with *seed* and *spirits*, approves himselfe the onely cheerfull loser, and with the *plaudit* of his wings and voice, crownes his past triumphs, and lights his wedding Torch at his own Cinders. And yet he also flags after long game, and like an *Emerit* souldier resignes his Commission. And so the *Hens* likewise, like *Plants* worn out, grow decayed *Matrons*, and fore-go their *Nurseries*.

How

*How a perfect and fruitfull Egge is  
produced by Male and Female,  
according to Aristotle.*

EXERCIT. XXIX.

**W**E have lately said, that an Egge, especially a fruitfull one, is no spontaneous issue; nor doth proceed from any thing but a Hen, nor yet a fruitfull one from her neither, without her intercourse with a Cock: According to that of Aristotle; We are to conclude, that male and female De gen. an.  
l. 1. c. 2. are the chief principles of Generation: the Male, because he hath the preeminence in the original of the Motus and Generation, the Female in the original of the Matter.

Now according to our decision, A fertile egge is truly a sperme, and genitall seed, Analagous to the seed of Plants, and the first conception resulting from both Parents, and the promiscuous production of them both. For as an Egge cannot have a being without a Hen, so it cannot have fecundity without a Cock.

It remains therefore that we enquire, how the egge is made by the hen, and how it is made fertile by the Cock: for we see that subventaneous egges, and those animate too, are produced by the hen: but yet are not prolifical without the Cock. And therefore both Cock and Hen lay their stock together to constitute a fertile egge. And yet (as I conceive) not in that manner as Aristotle would have it; namely, that the Male should be Master only of the original of the Motus and Generation: and  
the



160 *How the perfect and fruitfull Egge* Ex.XXIX.

the Female onely contribute the Matter. For the contrary appears in Subventaneous egges: And though it be true, where he saith: The Male and Female are different according to reason, because their faculties are diverse, and according to sense, because some of their parts are divers too. The difference between them according to reason consists in this, that the Male is that creature which doth generate in another; the Female is that, which generates in it selfe, and out of which, that which is generated is made, being contained in that which doth generate it. But since these are distinguished by the diversity of the Faculty, and of the Office or employment; and every performance of an office requires an instrument; and the parts of the body are commodious instruments to the faculties; it is necessary that some parts should be accommodated for procreation and Coition; and that those parts should be different too, that so the Male and Female may be distinguished.

Yet it doth not thence follow, which he seems desirous to infer, saying: The Male is the Efficient, and by the vertue of its Geniture doth produce that which is designed out of the Matter contained in the Female: and the Female doth always contribute the Matter. So that it is necessary that the Female should contribute the Body, and the Quantity or Magnitude, but there is no such thing required at the males hands. Nor is it necessary that the Instruments, or the Efficient it self should be in those things that are produced by them. The Body therefore proceeds from the female, and the soul from the male. For the Substance of a Body is the soul. For an egge, and that an animate one too, is produced by the Hen alone, without the Cock. Whence it appears, that the Female or Hen is also the Efficient cause; and that all power of Production, or the Soul doth not proceed from  
the

Ex.XXIX. is made by Male and Female, &c. 161

the Male. And this the example urged by Aristotle seemes to confirm: for he saith. Those creatures that proceed to Coition, and are not of the same kind (which they do, whose season is alike, and time of bearing, together neer at hand, and do not much differ in the dimensions of their bodies) do bring forth their first issues like to themselves, partaking of the Species of both kindes: as those that are begotten by a Wolfe and a Bitch, or by a Partridge and the Dunghil-Brood: but in proceß of time, these diverse Parents, produce a diverse issue, the off-spring at length assuming like form with the Hen, as forraigne Seed is at last transformed according to the Nature of the Soile where it growes, for the Soile contributes matter and Body to the Seed.

By which words it is manifest, that in the Generation between a Cock-Partridge and a Dunghil-Hen, the Male is not the sole efficient, but the Female is concerned too: because a Common Species and form, and not that of the Male onely, is produced; being alike, both in Body, and Soul, as well to the Female as the Male. Now the Soul is the Forme and Species of an Animal.

And againe: the Female may seem to have most right to the title of Efficient, for he saith, in Proceße of time, these diverse Parents produce a diverse issue, the off-spring at length assuming like form with the Hen. As if the Seed of the Male were lesse powerful; and did in time lose the Species which it imprints; as being razed out and expunged by a more potent Efficient. And this that instance concerning the soil doth more strengthen: For, forreign Seed is at last transformed according to the nature of the soile where it growes. By all which it seemes probable, that the Female is a stronger party in Generation, then the Male: For in the

M

Univers

De gen. an.  
1.2.v.4.

De gen. an.  
l. 1. c. 2.

*Universe likewise, the Earth is held to be, as it were, the Female and the Mother: But the Heavens and the Sun, and the other Bodies of that kind, Philosophers call by the name of Father and Genitor. Now the Earth also produceth many things of its own accord, without any Seed: And amongst Animals, some Females do procreate of themselves without a Male; (thus the Henne generates a Subventaneous Egge) but the Male never begetteth any thing without a Female.*

Nay by those very Arguments which contend to prove the Male to be the Principle of Generation, and the primary *Efficient*; the energy or efficiency of the Female seems to be confirmed, and ratified: For that is to be counted the Primary *Efficient*, in which the reason of the *fatus*, and form of the Production is most eminent; and whose apparent similitude is discovered in the *fatus*, and also which hath an existence it self before, and then generates. Since therefore, the Form, Reason, and Similitude of the *fatus* is no lesse (nay more) in the Female then in the Male; and she also is in being before, as a Primary Mover: We may well conclude, that the Female is as eminent an *Efficient* of Generation, as the Male.

And though Aristotle truly say, that the Conception or egge assumes no part of its body from the Male, but onely its form, species, and soul, and that  
de gen. an.  
l. 2. c. 4. the Female contributes onely the body, and quantity: Yet it doth no way appear to the contrary, but that the Female doth contribute in some sort, both Form, Species, and Soul, (and not the Matter singly) As is evident in the Hen, which produceth Egges without a Male (as the Trees beare their Fruits, Herbs and Seed without any distinction of Sexes at all.) And Aristotle himself confesses,  
that



IX.  
were,  
d the  
phers  
by the  
a ac-  
mals,  
thout  
cane-  
thing  
tend  
erati-  
or ef-  
and  
mary  
and  
those  
and  
and  
Rea-  
nay  
e also  
may  
ent an  
e Con-  
on the  
d that  
entity:  
but  
fort,  
stater  
duceh  
their  
nction  
stelles,  
that

Ex.XXIX.is made by the Male and Female &c. 163

that even a Subventaneous Egge hath a Soul. The *Ibid.*  
Female therefore must be the *Efficient Cause* of the  
Egge.

And yet though there be a Soul in the Subven-  
taneous Egge, yet that Soul is not *Prolifical*; and  
therefore we must acknowledge that the Henne is  
not properly the *Efficient* of a Perfect Egge, but  
that she is so made, by Authority and Commis-  
sion procured from the Cock. For an Egge, except  
it be *Prolifical*, cannot justly be said to be Perfect.  
Now such an Egge is produced onely by the Male;  
or rather by the Henne, having received such in-  
structions from the Cock; as if from his Coition,  
the Female did receive the Art, Reason, Forme,  
Lawes, Rule and Model of the future *Fetus*. Thus  
the Female (like a fruitful Tree) being made fer-  
tile by Coition, is made *Oviparous*, bearing per-  
fect and *Prolifical* Egges. For though the Henne  
have at present no rudiment of Egges at all ready  
in the *Ovary*, yet being fructified upon Coition,  
she suddainly after, both hath, and layes Egges;  
and those also *Prolifical* ones. And here the experi-  
ment of poor Women is of use; *Which having a Fabric.*  
*Hen at home, but never a Cock, they commit her for a pag.37.*  
day or two to a neighbours Cock: and from that small  
communication, all her egges succeed fruitful, for all that  
season.

That is, not onely those Egges, which now  
are *Yolks*, and onely want a *White*, or else have  
some Rudiment of their future growth, though  
never so litle; but even those Egges also which  
are not yet begun at all, and are to be con-  
ceived a great while hence, are all rendered fruit-  
ful by the same vertue.

The

The Benefit of this Disquisition concerning Fecundity.

EXERCIT. XXX.

THE Disquisition wherein we examine, What it is in the Egge that renders it fruitful? is very subtle, and difficult, and of exceeding great use: As also what is in the Conception, what in the Seed, and what in the Hen that confers Fecundity upon them: Likewise what in the Cock distinguisheth him from a barren cock? Is it the same cause, which we call the Soule in the Fetus? or some part of the Vegetative Soul? For the knowledge of the First Cause conduceth much to the compleat science of Generation: For Science springs from Known Causes, especially those that are the first Causes. Nor is this indagation lesse useful to the knowledge of the Nature of the Soul. But when once the verity of this is thoroughly discovered, not onely *Aristotles* opinion concerning the Causes of Generation is refuted, and chastised; but even those things also which Physicians have written against him, are easily disproved. Our *Quere* therefore is, whether that which affords the Fertility to the Egge, Yolk, Papula, or Whelke, Cock, Hen, and to its Womb, be one and the same thing, or diverse? Likewise whether it be a Substance from whence this vertue flowes? For it seems to be susceptible of Powers, Faculties, and Accidents. Or whether it be also a Corporeal thing! For that seems to be mixt it self, which generates a mixt thing; namely a similitude common to both Cock and Hen; such as is that ambiguous Species produced by a Cock-Pheasant and a Dung-hil-Hen,

Ex. XXX. concerning Fecundity.

165

*Hen.* It seems also to be a Corporeal thing, which suffers from without; in so much that it doth not onely produce feeble *issues*, but deformed also, and sickly ones, and such as are obnoxious to, and do inherit the Virtues, and Vices of their Parents.

We may also make a question concerning each particular, whether that which confers the Fertility, be ingenerated, or comes from without? Namely, whether it be transferred from the Egge to the Chicken; from the Hen to the Egge, and from the Cock to the Hen. For it seems to be a thing *ex Traduce*; namely, which is transferred from the Cock to the Hen; and from Her to the Egge, the Womb, and the Ovary: From the Seed to the Plant, and back again from the Plant to the Seed. For this is common to all things that are perpetuated by Generation; namely, that their first rise should result from Seed. Now the Seed, the Conception, and the Egge are all of one and the same kinde, and that which renders these Fruitful, is in all of them the same thing, or something of a like nature; and that is some divine thing, and hath an analogy to the Heavens, to Art, Intellect, and Providence. As is plain by the wonderful operations, artifice and counsel of those creatures, in whom nothing is constituted in vain, rashly, or by chance, but all for some Good, and to some End. We shall hereafter be more ample, concerning the Universal Speculation, and knowledge of this thing: Having already spoken as far as occasion hath presented it self to discourse of it by the by, in order to the *Hen-Egge*. Namely, how many things is that thing in, which brings Fecundity? and how is it in them? whether as an Accident, as either an Affection, a Habit, a Power,



or a Faculty? or as a Forme, and a Substance? or as a thing Contained in a thing Containing? or as a thing reserved in some peculiar part? For it is most certain, that the very *Subventaneous egge* is compleat in all parts as far as sense can discover, and yet it is Barren: and likewise, that the *Uterus*, and also the Hen are perfect, and so is the Cock; and yet they all were barren, were they deprived of that which conveys their Fecundity to them. All which we shall relate, after we have expounded, What, and How, the two *Principles*, Male and Female, do confer to the Egge, and to Generation; and likewise in what manner they may both be called the *Efficient Causes* and *Parents* of the egge.

*That the Egge doth not proceed from the Cock and Henne, after that manner which Aristotle would designe.*

## EXERCIT. XXXI.

**I**T is most certain, that the *Fertile Egge* cannot be made, but by both Cock and Hen: and yet not in that fashion as *Aristotle* thought, as if forsooth, the Cock alone were the prime *Efficient*, and the Hen did contribute nothing but the *Stuff*, or *Materials*.

*de gen. an.* For I am not of his mind, where he saith:  
*l.1.c.4.* *When the Seed of the Male enters into the Womb of the Female,*

Ex. XXXI. Aristotle would have it.

Female, it doth reduce the purest part of the Excrement into a consistence: and a little after. But when the excrement of the Female is in the Womb, it is made by the Geniture of the Male, like to coagulated Milke. For that Coagulum is Milke containing vital Heat, which carrieth parts that are alike, the same way together, uniting, and joining them. Now the Geniture demeanes it self just so towards the Menstrua, or excrement. For the nature of the Menstrua and of Milk is the same. Therefore the parts being gathered together, the corpulent humour is discarded, and upon the arefaction of the more earthy part, the Membranes result to encompass the whole; and this upon necessity, and to some intent and use besides. And these things proceed in the same manner, as well in all Oviparous, as Viviparous Animals.

But the matter is much otherwise, in the generation of the Egge. For the Seed (or Geniture rather) proceeding from the Male in Coition, can by no means enter the Womb. Nor hath the Hen after Conception, any excrementitious substance, or purer part of any such substance, or any Blood at all in the Cavity of the Womb, which might receive perfection from the Geniture of the Male. Nor are the Parts of the Egge (namely the membranes and the Liquors) procured by any kind of Coagulation; nor is there found any thing like Coagulated Milk, as is clear and evident out of what hath passed. And hence it follows, that neither the Conception (out of which the Animal springs, as out of Fertile Seed) is after that manner as Aristotle imagined: For the Conception is after the same manner in Viviparous, as the Egge is produced in Oviparous creatures: as himselfe confesses, and shall anon appear in some of our Observations. For it is a certain truth, that the

## Nor after that manner. Ex. XXXI.

EGGE, be it barren, or fertile, is made and formed by the Hen alone: onely the fertility indeed is derived from the Cock. I positively affirme, that the Cock conferres neither Matter nor Form to the Egge; but onely that thing by which the Egge is Fertile, and made fit and capable to produce a Chicken. And this Faculty the Cock imparts by his *Geniture*, discharged in *Coition*; not onely to the Egge which is then begun, or already made, but to the *Womb* also, and the *Ovary*, and likewise to the Hen her self: and that after such a manner, that the egges which are yet to come (of which there is now no particle in being either in the *Ovary*, or any other part of the *Body*) shall have the happinesse to be fruitful by it.

## Nor after that manner which Physitians phansie.

## EXER. XXXII.

THE Conception according to the opinion of Physitians is thus: In *Coition* the Male and Female being both delighted, do eject their *Geniture*, or *Seed* into the *Cavity* of the *Womb*; and there their united stock or contribution is mingled together; obtaining from both the *potentiality* of *Matter*, and the *activity* or force of the *Efficient cause*. And that so it comes to passe, as the *Geniture* of this or that Parent shall get the upper hand, the conception proves either *Male* or *Female*. And they farther suppose, that immediately after *Coition* (the

Active



Active and Passive ingredients now cooperating together) something of the Conception is put in hand, and begun.

They still affirming, contrary to those who side with Aristotle, that the Male is no more the Efficient cause of Generation, then the Female, but something compounded of them both : & likewise, that neither the Menstruous Blood, nor the purest part of it ; but the Sperm it self is the first Matter of the Conception : and upon this ground, they call the first ground-works, or first parts of the Conception, *Spermatical Parts* ; which are afterwards to be nourished and supplied by *Blood*.

But the thing is plain, that this also is not the manner, by which the *egge* is produced by the Cock and Henne. For the Hen doth emit no Seed at all in Coition, out of which the *egge* may be framed : nay more then this, there is no part of her Seed to be any where found : for she is quite destitute of all parts necessary to the Generation of Seed ; namely, of *Testicles*, and *Spermatical Vessels*. For though the Hen hath an Efficient power together with the Cock, (as appears by our former discourse) and that power which renders the *egge* fertile, be in some sort a mixt power ; yet this proceeds not from the over-ruling force of the Genitures, or from the manner of their mixture : for it is very certain (and Fabricius confesses it) that the Cocks Seed enters not into the Cavity of the Womb : nor is there any particle of the *egge* made in the Womb presently upon Coition ; though Aristotle generally affirms there is, (saying, that some part of the Conception doth forthwith insue) Nay I shall demonstrate hereafter, that this commixture of Seeds doth never obtain in any Animal whatsoever ; and that presently after Coition (though it succeed and be

170 *That both Male and Female are Ex. XXXIII.*

be fruitful) there is no particle of Seed, or Blood, or of any begun or attempted Conception, really in the *Womb*, or to be found there. Nor is there in truth any thing to be discerned, in the Conception or *Egge*, that may any ways argue the Seed of the Male to be contained, or mingled in it. The Common people indeed do falsely conceive, that the *Chalazæ* are the *Cocks Seed*: and I much wonder, that since there are two of them (in each extremity of the *egge*, one,) that no man hath hitherto fondly pronounced, that the one was the *Cocks*, and the other the *Hens Seed*. But this popular error is soon blown over; for the *Chalazæ* are in like manner found, both in the *Subventaneous*, and *Fertile egge*.

---

*That both the Male and Female, are  
the Efficient of Generation.*

EXERCIT. XXXIII.

THE *Physitians* do rightly maintain against the *Aristotelians*, that both Sexes participate of the efficient power; because that which is generated, is a thing compounded of them both: for it is mixt of them both, in the figure and similitude of the Body, and in the Species too; as suppose it a thing mixt between a *Partridge-Cock*, and a *Dunghil-Hen*. And it is very consonant to reason, for a man to conceive, that those are the *Efficient causes* of a Conception, whose commixture that which is produced, doth represent and express.

And

*Efficient causes of Generation. Ex. XXXIII. 171*

And this is *Aristotles* opinion. In some creatures, *Metaphys.* 1  
saith he, it is apparent that, that which generates is l. 7. c. 8.  
such like, as that which is generated: and yet not the  
same, not that very numerical thing, but of the same  
Species, as in natural productions. For a Man begets  
a man, unless something befall præternatural; as when  
a Horse begets a Mule, and the like. For that which  
is common to a Horse and an Ass, is not called Propin-  
quissimum genus, the Next Kind: and yet they two  
may be commixed in one, for such is a Mule. And in  
the same place he saith; The Generant is sufficient to  
generate, and be the cause of the existence of the Spe-  
cies in the matter: but such a Species being now in  
such particular flesh and Bones, is now several persons,  
as Callias, and Socrates are.

Wherefore since such an entire forme, as namely  
of a Mule, is mixt of both; namely, Horse and  
Ass: the Horse alone is not sufficient to produce  
this form of a Mule in the Matter; but as the whole  
entire form is mixt, so another efficient cause must  
be conferred and joyned to it from the Ass. That  
therefore that doth produce a Mule mixed of both,  
must be it self adequate, and mixed too, if it be  
*Univocal*. As for example. This Man and that  
Woman, do beget this Socrates; not under the ca-  
pacity of being both of them *Homines*, Men, and  
so are of one and the same species; but by reason,  
that this particular Man, and that particular Wo-  
man, are of humane kind, composed of this and  
that particular flesh, and bones: of both which since  
Socrates is a kind of Mixture, and is mingled of  
them both; that of which Socrates is made, must  
needs be as it were a compounded *Univocal* mixt  
thing; that is to say, the mixt Efficient of a mixt  
Effect. And therefore the Male and Female, are  
not generative apart, but as they are united in

*coition*



172 *Of the Matter of the egg, contrary* Ex. XXXV.

*Coition*, and made, as it were, one entire *Animal*; and thence from them both, as from one, the true efficient immediate cause of the *Conception* doth result, and is deduced.

The *Physitians* also, while they, minding onely what befalls *humane kind*, give resolutions at large concerning *Generation* in general; and it seeming probable to them, that the *Geniture* flowing in *Coition* from both *Parents*, is the true *Sperme* or *Seed*, proportionable to the *Seed* of *Plants*; doe not without reason constitute that mixture which is the next efficient cause of the future *Fœtus*, out of the mixture of the *Seed* of both *Parents*: and therefore affirme, that such a mixt body is contained in the *Womb* presently upon *Coition*, and is the first *Conception*. But our precedent *History* makes it appear, that the thing is clean otherwise in an *Egge* (which is a true *Conception*.)

---

*Concerning the Matter of the Egge,  
contrary to Physitians and A-  
ristotelians.*

EXERCIT. XXXIV.

THat which *Physitians* deny in opposition to the *Aristotelians*, namely that the *Blood* is the First Matter of the *Conception*, doth evidently appear out of the *Generation* of the *Egge*. For there is no *Blood* at all contained in the *Womb* of the *Hen*, either in *Coition*, or before, or after it:  
Nor

Ex. XXXIV. to *Physitians* and *Aristotelians*. 173

Nor are the Rudiments of the *Egge* sanguine, but white. And many living Creatures conceive, in whose *Genitals* (if you open them nimbly) not one drop of *Blood* is to be seen.

But while they contend, that the *Mothers Blood* is the Nutriment of the *Fetus* in the *Womb*, especially of the *Partes Sanguinea*, the bloody parts (as they call them) and that the *Fetus* at first, as if it were a part of the Mother, is sustained by her *blood*, and quickened by her *spirits*: in so much that the *Heart* beats not, and the *Liver* sanguifies not; nor any part of the *fetus* doth execute any publick function; but all of them make *Holy-day* and lie idle; in this Experience it selfe confutes them. For the *Chicken* in the *egge* enjoys his own *Blood*, which is bred of the liquors contained within the *egge*; and his *Heart* hath its motion from the very beginning: and he borroweth nothing, either *blood*, or *spirits*, from the *Hen*, towards the Constitution either of the *Sanguineous* parts, or *Plumes*; as those that strictly observe it may plainly perceive. And I make no question, fully to demonstrate in my succeeding Observations, that the *fetus* of *Viviparous* creatures, while they are yet imprisoned in the *Womb*, are no way sustained by the *Mothers blood*, nor vegetated by her *spirits*, but do rejoyce in their own *Soules* and indowments, (as the *Chicken* uses to do in the *egg*) and sate themselves from their owne stocke of *Blood*.

But as for that which concerns the Matter of the *fetus*, arising from *Male* and *Female*, and that so magnified manner of Generation, so much countenanced by the confident *Schools* (namely, that the *Conception* is rendered *prolificall* from the commixture of the *Genitures*, and their mutual Action and

and *Passion*) as also those other Heresies of theirs, concerning the *Seed of Females*, and concerning the division of *Parts* into *Spermatical*, and *Sanguineous*; many, and those very remarkable and excellent observations, which shall be treated of hereafter, have compelled me to dissent from them. I shall at present say onely this, that I extremely wonder, how *Physitians* (especially such as are skilfull *Anatomists*) should prop up their opinion upon two arguments, as most invincible; when those very arguments, if rightly understood, do make against them rather.

As for Instance. From that *Concussion*, *Solution*, and *Profusion* of Humour (which befalls Women many times with delight, in *Coition*) they conclude that all Women do emit a *Semen* in *Coition*, and that that *Semen* is necessary to *Generation*. Whereas, to passe by this reply, namely, that the *Females* of all *Animals*, nay all *Women* have not such a *Profusion*; and that it is no way necessary that the *Conception* must be frustrate without it: (for I know many *Women* that are Mothers without it, and some also, which upon having it, were indeed much affected with enjoyment, but came much short of their former fruitfulness: Besides infinite and innumerable examples of *Women*, who though they receive much satisfaction by their Husbands, do yet emit nothing, but do conceive how ever) But I most admire that those, who count this *Emission* necessary to *Propagation*, did not mind how that humour is ejected clean out, and lost for the most part neer the *Clitoris*, and outlets of the *Secrets*; but is seldom admitted into these, and never into the *Uterus*, that so it may be commixt with the *Sperma* of the *Male*; and that It is also of an *Ichorous*, and *Serous* consistence, as  
Urine



Ex. XXXIV. to Physicians and Aristotelians. 175

Urine is, and not so Compact and Unctuous as the *Genture*, which the very touch denoteth.

Now wherefore should that be excluded out of Doors, which is of so great consequence within? Ought that humour, under pretence of departure, be thrown out to the utmost approaches of the *Uterus*, that so it may be recalled again with the greater bounty and favour?

Another Argument they erect upon the *Spermatical Organs of Women*; namely, the *Testiculi*, and the *Spermatical preparing, and leading Vessels*, which are supposed to conduce to the *Generation of the Semen*.

But for my part I wonder much, how they fan-  
sie, that so elaborate, concocted, and quickening a *Semen*, can arise from so imperfect and obscure parts, so that, that of theirs (when the controversy concerning the preeminence and overruling power is in debate; namely, whether the *Males* or theirs commands in chief, and which of the two is to be reputed the *Efficient*, or *Agent*, or the *Matter*, or *Patient*) should exceed the *Males* in power, spirit, and generative ability; and should subject the *Males* seed under it, inforcing it to submit it self to supply the place of the *Material Cause*, notwithstanding it is digested by so quick & active a heat, refined in such variety of *Vessels*, and darting it self with so much activity. But of these more hereafter.

In the mean time it is most certain, that the *Hen-egge* is generated by no such conjugal *Profusion*: though the Mother after recreation (as one ravished with delight) shakes her feathers for joy, and as if she grew proud from the Boone she received, composeth and rectifieth all her extravagant *Plumes*: like one that adored the deity for the  
grand

grand benediction of multiplying issues. The *Pigeon* (especially that kind of *Pigeon* which is transported hither out of *Africa*) expresseth wonderful content from the enioyment of her Male, leaping, and spreading her taile, and sweeping the low earth with the bristles of it, and then combing and rectifying her Plumes with her Bill; as though she deemed nothing comparable to the blessing of fertility.

We have said before, that the first matter of the *Egge* is not formed of Blood, as *Aristotle* thought; nor yet as the *Physitians* conjecture, out of the commixture of the Males and Females *Geniture*. But from whence we do derive it, is partly already shewen in our *History*, and shall be more largely explained hereafter, when we treat in generall of the matter which doth constitute every *factus*.

---

How far the Henne is an Efficient  
Cause in the Generation of the  
Egge, according to Aristotle:  
and why the assistance of the  
Male is required.

E X E R. XXXV.

WE have already proved the *Cock* and *Henne* to be the two Principles of Generation in regard of the *Egge*, though we are otherwise persuaded of the manner how it comes to passe, then  
*Aristotle*

Ex XXXV. in the generation of the Egg, &c. 177

*Aristotle* and *Physitians* are. For we have made it manifest out of the generation of the *Egge*, that the *Hen* as well as the *Cock* is an efficient cause, and hath in her a principle from whence the mutation proceeds, and also a constituting faculty: though in Coition, neither the *Cock* doth confer matter to the *Egge*, nor doth any profusion of seed result from the *Hen*, by which the *Egg* should arise. It is therefore evident, that nature (amongst some *Animals* at least) did not therefore institute a distinction of *Sexes*; that the one (as an *Agent*) should contribute the form, and the other (as the *Patient*) the matter, as *Aristotle* did conceive: nor that a *semen* should result from both in coition, that so out of the mixture of them, a *Conception*, or *Egg*, should be framed, as *Physitians* imagine.

Now since these two opinions doe comprehend the whole Legend of *Antiquity*, concerning the causes and principles of *Generation*: it appears that all men were hitherto ignorant of the reason, both why the *female* doth not generate alone by her selfe (as *Plants* doe) but requires the association of the *male*: and also how the *conception*, or *egge* is procreated both by *male* and *female* thus conjoynd: and likewise in what either of them conduce to the work, and to what end and purpose coition was instituted.

*Aristotle*, contrary to his own universal Hypothesis (namely, That the male is the *Agent*, and the female only for the matters sake) perceiving the egg to proceed from the *Hen* without any help of the *Cock* at all, was inforced to subscribe, that the *female* also is an efficient cause: and that the *Egge*, when it is excluded, doth conserve, nourish, and augment it selfe, and produce a *fetus* out of it selfe: (as the *egges*, or *spawn* of *fishes* doe) and

N

there-



de gen. an.  
1.3.c.7.

therefore he concludes, that there is also a *soule* even in a *subventaneous*, barren egg. And how far forth the *Female* is an *Efficient*, and also a *subventaneous* egge informed by a *soule*, he attempts to explain, where he saith. *Subventaneous* eggs admit *Generation* as far as they may; but that they should be compleated to the very *fecundity* of an *Animal*, is quite impossible; for to that a *sensitive soule* is required. But even females, and all things that live at all do obtain the *vegetative faculty* of the *soul*, as hath bin often repeated. And therefore this barren egg considered as the *conception* of a *Plant*, is compleat, but considered as an *Animals*, it is incompleat. By which words he seems to consent, that the *Vegetative soule* is also in the very *subventaneous* egge, because that *soule* is in all living things; now an egge doth live. He also allowes the *Hen* a creating *Prerogative*, and a power of inducing a *Vegetative soule*: because all females have that privilege: and therefore a *subventaneous* egge considered under the capacity of a *Plant*, and living as that doth, is stiled a perfect *conception*, but under the rank of *Animals*, an imperfect one. As if the male were no whit requisite to the being of the perfect *conception* or egge, but onely that out of that egg an *Animal* might proceed: Not to the complement of the egge, in order to any perquisite relating to its own perfection (for the *conceptions* of plants themselves are in this sense compleat) but that it may be endowed with an *Animal principle*. So then, the *Egg* is made by the *Hen*, but is made *prolific* by the *Cock*. *Aristotle* in the same place goes on: In all the *Genealogy* of *Birds*, there is a male and a female; so that a *Hen* may make her *conception* perfect, as a *Plant*, though it be *maltered* by *coition*: but as an *Animal*, she can

not

not perfect it; nor can she impower it to produce any other thing out of it. Nor is it rendred as the fruit of a Plant simply, nor as of an Animal, by coition. He speaks of a subventaneous egg: and addes further: But those eggs which are conceived by coition, and are now discovered to have obtained some portion of the White, they becom fruitful by virtue of that Cock who was first concerned in coition; for they are now furnished with both Principles.

Whereby he seems to confess, that the Female also is an Efficient in Generation, or hath a generative power; because every female hath a vegetative soule: now generation is a faculty of the vegetative soule. And upon this ground, when he propounds the difference between the male and female, he even there owns them to be Generative both: for he saith, *We call that animal the male, which begets or generates in another, and that the female, which generates in it self.* And therefore according to Him, both doe Generate; and as there is in both a vegetative soul, so is there in both a Generative power. But how these differ, hath been shewed before in the History of the Egge. Namely the Hen, alone by her self, without any assistance of the Cock, Generates a subventaneous egg, (as Plants do from themselves produce a fruit) but she doth not produce a fertile egge, without either the antecedent, or subsequent Coition of the Cock. The female doth generate, but it is only in some sense: and the males coition is required, that that generative faculty should be perfected in the female: that so she may not only bring forth an egge, but such an egge that may produce a chicken. And for this defect in the females generation, the male seems to have been created (as shall hereafter appeare) that so what the female cannot

180 *A perfect hen-egg hath two colors.* Ex. XXXVI.

compleat alone, (namely the *seed*, or *fertile egge*) that the *male* should supply by *coition*; wherein he doth impart that power either to the *Hen*, or the *Egge*.

---

*A perfect Henne-egge hath  
two Colours.*

EXERCIT. XXXVI.

**A**ll eggs therefore are not *perfect eggs*; but some are reputed *imperfect*, because they have not yet attained their just magnitude, which they afterwards doe receive abroad: And others, because they are yet *improlifical*, and afterward doe borrow a *prolifical power* from without; as *Fishes eggs*, or the *spawn* of fishes. Other eggs also, are by *Aristotle* counted *imperfect*, because they are of *one colour* onely; but those that are of *two colours*, *perfect*, as being constituted of a *Tolk* and *White*: which are conceived to be more distinct, better concocted, and endowed with more heat. And therefore those that are called *Ova Centenina*, which *Fabricius* conceits to be onely constituted of the *Reliques* and *Remainders* of the *White*, are only of one colour, and reputed *imperfect*, because of the defect of their heat, and their own imbecillity. But amongst all the eggs that are, there is none more *perfect* then the *Hens*, which is still produced *perfect*, and adorned with  
all



Ex. XXXVI. *A perfect hen-egg hath two colors.* 181

all its liquors and accoutrements, and of a convenient and just magnitude.

Now Aristotle gives this reason why it comes to pass that some Eggs are of two colours, and others of one only: because, saith He, in hotter Animals those things out of which the rudiments of Generation, and those out of which the Aliment is derived, are always distinct and apart: and of them one is white, and the other yellow. As if the Chicken took its life from the White, and were onely fed by the Yolk. And in the same place he saith. That part of it which is hot, doth more resemble the complexion of the parts that are to be made; but that which is the more terrene part, affords onely supply to the body, and keeps at greater distance from it. And therefore in eggs that have two colours, the Animal assumes its beginning from the White. For the Animal rudiment is in the White, and the nourishment is derived from the Yolk. Therefore we see his opinion is, that the foresaid Liquors are distinct, and that eggs are produced party-coloured.

And these Assertions of his, are partly true, and partly false. For it is false, that the Chicken is made out of the White, and fed by the Yolk. For by our History of the Fabrick of the Chicken, both from the dissemination of the Umbilical Vessels, and the distribution of their propagations, which without all question doe serve for the attraction of the Aliment, it is most manifest that both the constituting matter and the Aliment, are from the first original supplied both from the yolk and white; for some part of both these liquors doth melt and dissolve. And also the Macula, by whose first dilatation the Colliquamentum is made, which is also stiled by us the Oculus, or Eye of the

*EGGE*, is plainly seen to be imprinted into the coat of the *Yolke*.

And yet for all this, the distinction of the egg into the *yolk* & *white* doth seem to be very necessary: because those two *Liquors*, as they are without all doubt of a diverse nature, so doe they serve to a diverse use. And that is the reason why they are distinct in every perfect egg; one of them being the *Aliment* which is next at hand, and the other, that which is farther off: with the one the *fetus* is sustained at its first formation, with the other in succeeding time. For it is most unquestionable (as *Fabricius* affirms truly, and we also shall explain anon) that both the *Yolk* and *White* are the *Aliment* of the chicken, and that the *White* is first spent. Wherefore I agree with *Aristotle* against the *Physitians*, that the *White* is the most sincere, most concocted, and elaborate part of the *EGGE*: and therefore as being the hotter part, it encompasseth the whole circumference of the *EGGE*, which is yet in the *Wombe*, whilst the *Yolke* as the more terrestrial part doth reside in the Center. For the *White* seemes to containe more plenteous animal heat in it, and therefore to be the neerer and first nourishment. And so also upon the same account, the exterior part of the *White*, seems to be more simple, and better concocted, then the interior.

In that *Physitians* affirme, that the *Yolke* is the hotter part of the *EGGE*, and most nourishing, I conceive they understand it, in relation to us, as it is become our nourishment, not as if it doth supply more congruous aliment to the chicken in the *EGGE*. And this appeares out of our History of the *Fabrick* of the *Chicken*: which doth first prey upon

Ex. XXXVI. *A perfect hen-egg hath two colors.* 183

upon and devour the thinner part of the *white*, before the grosser : as if it were more proper diet, and did more easily submit to transmutation into the substance of the future *fetus*. And therefore the *yolk* seems to be a remoter and more differred entertainment then the *white* ; for all the *white* is quite and clean spent, before any notable invasion is made upon the *yolk*. Nay, the *yolk* is found in the *Abdomen* of the *Chicken*, even after his exclusion, as if it were reserved for the *Infant-chicken* instead of *Milk*.

The two-coloured *egges* therefore are most perfect, as being more distinct and wrought up by a more vigorous heat. For since there ought to be treasured in the *egge* not onely the *matter* of the *Chicken*, but his first *feeding* too : that which is provided for a *perfect animal*, ought it self to be *perfect* too ; and such is that *egge* which consists of two distinct complexioned parts : whereof the one is the former, and more simple, and therefore of gentler digestion ; the other the latter, or more remote, and therefore translated into the substance of the *Chicken* with more difficulty ; (now the *yolk* and *white* are thus different amongst themselves) and therefore *Perfect egges* are *Party-coloured*, compounded of a *white* and *yolk* : as containing and storing up in them several provisions of harder or more friendly digestion, according to the several age and ability of the *Chicken*.



## How the Egge is supplied with its White.

### EXER. XXXVII.

**I**T appears by our History that the *primordia* of the eggs in the Ovary are wondrous litle, resembling small whelks, and lesse then the seed of Millet, being full of a white watry moisture: and that these *Papule*, or whelks do at length shoot up into yolks, and that those yolks are at last invested and cloathed with a white.

Aristotle seemes to be of opinion, that the white is generated out of the yolk by way of Separation. *de gen. an.* Let us read his words: *The Sex*, saith he, *is not the* cause of the party-colours, as if the white did proceed from the Male, and the yolk from the Female; but both are derived from the female or Hen. But one is hot, and the other cold. And in those creatures that have good store of heat, they are distinguished from one another; but where that heat is fainter, they are not distinguished. And for that reason the conceptions of such Animals are of one onely colour, as is said. Now the Males seed onely doth constitute the egge: and therefore at first the conception of all Birds is white, and small, but in process of time, it is all yellow, because now a larger quantity of blood is admixed; and lastly, the heat abating, the whiter part environs it round, as being a humor equally tempered on all sides. For the white part of the egge is naturally moist, containing in it an animal warmth, and therefore it is placed about the egge, and the yellow earthy part remains within.

pag. 12.

But Fabricius conceives, The White of the Egge to grow to the yolk by a juxtaposition meerly. For while, saith

saith he, the *yolk* rowleth through the second Uterus, and falls down by degrees, it doth by degrees gather to it a part of the *White*, which is purposely generated in the Uterus, that it may cleave to the *yolk*; untill the *yolke* having now passed the intervening or middle spires, and arriving at the last of all; it is together with the *White* encompassed with the membranes also, and then assumes a shell. He conceits therefore, that the *EGGE* attaines its increase in a twofold manner; partly by the *Veines*, as it is with the *yolke*, and partly by an additional accession or apposition, as it is with the *White*. And this perhaps did induce him to be of that judgement; namely, because the *White* being boyled hard, doth easily part and distinguish into flakes, whereof the one lyes above the other. But this also doth befall the *yolk* not yet departed from the *Ovary*, if it be hard boyled as the former. And therefore being otherwise instructed by *Experience*, I rather join in opinion with *Aristotle*; for the *White* is not adjoined (as *Fabricius* would have it) but bred also, and furnished with the *Chalazæ*, and distinguished by several membranes, and divided into two white liquors: and all this, by the same vegetative soul, by whose industry the *EGGE* it self is distinguished into two liquors, (a *yolk* and a *white*.) For every part of the *EGGE* is formed and constituted by the same faculty which frames the whole *EGGE*. Nor is it true, that the *yolk* is first made, and then the *white* adjoynd to it. For, what wee see in the *Ovary*, is not the *yolke* of an *egge*, but rather some compound, comprehending both liquors mixed together. It resembles the *yolk* indeed in complexion, but the *white* in consistence: for being boyled hard, it is not friable (as the *yolk* is) but concrete and glutinous, and consisting of several flakes, as the *White*, and hath as it were

*Ibid.*

were a white Papula, or whelk in the midst. Aristotle seems to erect this separation from the diverse nature of the yolk and white. For, saith he, If you cast diverse egges into a bason, or such like vessel, and prepare them over a Chafin-dish of coals in such sort, that the force of the fire be not nimbler then the distinction of the eggs; the same thing will befall all that beap of eggs, as happens to every particular egge, namely all the yolks will gather and assemble themselves into the middle, and the Whites get round about them.

And this I have often experimented; and, who ever will, may try it: provided, he shake the yolks and whites together, and with a piece of butter digest them temperately into a Cake, having mingled them between two dishes, placed over a Chafin-dish of coales, or in an Oven; for he shall plainly see the whites cover the yolks which are assembled at the bottom.

*What the Cock and Henne do conferre  
to the Generation of the Egge.*

EXER. XXXVIII.

**B**Oth Cock and Hen are to be reputed the *Chickens Parents*; for both of them are necessary principles of the Egge, and both alike Efficient causes. For the Egge it self is the *Henns work*, and the Fertility the *Cocks*. Both are therefore Instruments of the *plastick virtue*, by whose means that species is continued to the world.

But since in some Animal species (as if the Male

were



were a useleſs thing, and the Female alone did ſuffice to the perpetuity of the ſpecies) there are no Males to be found at all, but the whole race is female, as in ſome ſpecies there are Males onely, and no Females at all to be found; for they do all by an emission of ſomething out of them into the mud, the earth, or water, progenerate, and preſerve their ſpecies: Nature ſeemes in theſe and the like creatures to have ſatiſfied her ſelfe with one ſex only, uſing that alone (as an inſtrument) for procreation.

And now again ſome other creatures have a ſeed provided for them, caſually as it were, without any diſtinction of ſex at all; namely thoſe creatures whoſe Birth is ſpontaneous. For as ſome things *Ariſt. phyſ.* are the productions of art, and the ſelf ſame things are *l. 1. c. 1.* the iſſues of chance too, as Health, for one: So like- wiſe ſome kinde of Animal ſeed is not ſimply produced from an univocal Agent (as a Man from a Man) but onely in ſome ſort univocal; (namely in all thoſe creatures whoſe extract and matter out of which they ſpring, is caſual in relation to them, and yet undergoes a mutation of it ſelfe, as the ſeed doth) namely, *Thoſe Animals that are not produced by coition, but are born of their own accord, are produced from ſuch an original as Inſects have, which breed a worm.* For as ſome Artificers *de gen. an.* work with their bare hands, but others again uſe *l. 3. c. 9.* inſtruments in all their operations; and the better ſort and more excellent Arts do imploy inſtruments of ſeveral figure and magnitude, to the execution of ſeveral, and eſpecially of the more curious and ſubtile Operations: (for the more eminent and more laborious works, are made for the moſt part of ſeveral motions, and doe require ſeveral ſubordinate productions and ends; & in this thing,

as

as in all other, *Art* is *Natures* Ape, and *Mimick*) so in like manner *Nature* doth of necessity set a-work more *instruments*, and those too of divers *faculties* and *abilities*, in the production of the more perfect, and more excellent *Animals*. For the *Sun*, or the *Heavens* (or what ever else is understood to be a common and general Father in the production of *living creatures*) do produce some things by themselves, by chance, and as it were without employing any intermediate *Instrument*, by an *equivocal* generation, and yet beget some onely by an *univocal* procreation: namely all those, that are begotten by some other of the same kinde, which doth contribute both *Matter* and *Form* to them.

And thus in the *Generation* of the most perfect *Animals*, where these *Principles* are distinguished, and these *seeds* of the *Animals* are distinct: the *Male* and *Female* are the two necessary requisite *Instruments* to the production. And in this manner is our *Hen-egg* produced from the *Cock* and *Hen*.

The *Henne* generates in her self, and therefore communicates *place*, *materialls*, *nourishment*, and *cherishing* to the conception; but the *Cock* conveighs *fecundity*: For the *Male*, saith *Aristotle*, doth ever complete the generation, and causeth a sensitive soul to be introduced, and from an *egge* creates an *Animal*.

Gen. an. l.  
2. c. 3.

And therefore proper *Organs* for both faculties are dispersed among the *Cocks* and *Hens*. Namely in the *Hen*, all the *Genital* parts are commodious for reception, and containing; and in the *Cock* for transferring and immission, or preparing of that thing which doth conveigh *fecundity* to the *Henne*, he being one that generates in another.

Now, having made strict discovery, by *Anatomical* dissection, of the parts sacred to *Generation*, we well know, what both *Male* and *Female* doe conferre

conferre to it. For the knowledge of the *Instruments* doth lead in a straight line, to their *functions* and *uses*.

*Some things worthy observation concerning the Cock.*

EXERCIT. XXXIX.

**T**He cock (as we have shewed you) is the *Primary Efficient* of the perfect or fertile *egge*, and the main cause of *Generation*. For were it not for the *cock*, a *chicken* could never spring from the *egge*; nor the *egge* it self have any being in many *Oviparous* creatures. And therefore we must make farther search concerning the *Action* and use of the *cock*, namely what advantage he brings to the *egge*, and the *chicken*, as well by *Coition*, as other offices.

It is evident that the *cock* (though, as I suppose, he wants a *Yard*) doth emit his *Geniture*, commonly called *Seed*, as may be collected from his *Genital Parts*; for the *Testicles* are furnished with it, and there is great abundance of it discoverable in the long and ample *Leading Vessels*. But whether it leap out, capering, and frothy by the activity of the *spirits*, and at several ejections (as in hotter *Viviparous* creatures) I am not yet able to resolve. But because I can finde no *Vesicles* containing the *Geniture*, by which it should be fermented, and dart forth, heightened by the *spirits* into a *Spuma*, or froth: and also finding no *Yard* through



through whose narrower *channel* it being protruded, it might leap, and result, verberating the Interiours of the *Hen*, especially seeing coition in Cocks so soon over; I rather believe, that there is onely a light tincture of *seminal* humour, such as doth onely moisten the Orifice of the *Pudenda*; and that the seed is speedily dislodged without any sprightly exilition: so that, what other *Animals* do ejaculate by several reverberations at one and the same Initiation, Birds (which do not long insist upon venereal undertakings) do expedite by many repeated Coitions. For those creatures that dwell long in venereal offices, do make but seldom repetitions: and such, among Birds, are the *Swan*, and the *Ostrich*: Because the *Cock* therefore cannot stay long in his performances, he doth execute that at several returnes, which other creatures do at several impulses. And though he neither have *Glans*, nor *Penis*, yet the extremity of the *deferent Vessels* growing turgent by *spiritus* (in Coition) doth extubérate after the manner of a *Glans*, by which he doth compress the Orifice of the *Uterus* of the *Henne*, it being bared and exposed by the apertion of the *Fundament*; and so bedewing it with genital moisture, he stands in no need of a *Yard* for the immision of his *Geniture*.

Now, we have shewed you, that the *Cocks Seed* is of so great vertue, that it doth render not the *Uterus* onely, but the Egge in the *Uterus*, the *Papula* in the *Ovary*, and lastly the whole *Hen* herself, and all the Rudiments of the Eggs, either already in being, or to be produced hereafter, *fertile* and *Prolifical*.

And therefore *Fabricius* rightly observed, that store of *Geniture* was intrusted to the *Testicles*, and  
*defe-*

deferent Vessels of the Cock: not that the Hen stands in want of much of it to fructifie each single egge; but that one Cock may approve himself sufficient for his severall Concubines, and repeated performances.

Now the brevity and rectitude of the Cocks spermaticall Vessels do conduce to the nimbler discharge of the Seed: for that which travels through long and perplexed Meanders, makes slower passage, and needs a more copious impulsive spirit to quicken its Exit.

Amongst the Males, none more jovial, none more haughty, nor of stiffer garbe, nor more effectual in concocting his food, then the Cock, a great part of whose Aliment is transformed into Geniture; and therefore Polygamy is convenient for him, as ten or twelve obedient Hens. For in some species of Animals, one single Male can treat abundance of Females, as we may see Stags, Bucks, and severall Cattel: and there are others againe where the lusty Female is not satisfied by severall Males; as the Bitch, and the Wolf; upon which score Meretrices *Lupa dicuntur*, Prostitutes are called Wolves, and Brothel-houses *Lupanaria*. And again some Creatures are more chaste, and reserve, as it were, a Conjugal integrity: so that one Male keeps faith with one Female, and both proceed vertuously to propagate their kind. For since Nature requires, that the Male should supply the defects of the Female in Generation, and that she alone is not sufficient to sustain, cherish, and defend her issue, the Male is added as a Consort to her, who should joyn in the task of generating, and nurturing the Young. Thus the Partridges enjoy a Conjugal Life, and because their mates cannot hatch so many egges at once, nor attend

tend the education when the Young are excluded, they are reported to build each of them a Nest. And so the *cock-Pigeon* takes his turnes of *Incubation*, and joynes in the erection and fabrick of his nest, and likewise in laying in provision for her off-spring. And so in like manner you may discover many examples of a Conjugal life amongst brut beasts, of which more hereafter.

But those Males that serve many Females (as the *cock*) their *Testicles* are much lined with *Seminal* moisture, and they are provided with long and large *deferent Vessels*. And at that time, and age that the cluster in the *Ovary* begins to ripen and become mature, and stands now in need of Fructifying, that the *Papula* may be perfected into *Egges*, the *cocks* *semen* begins to encrease, and his *Testicles* grow turgent and tumorous, and are also seated in the same place (namely neer the *Diaphragma*) into which they insfil fertility. And this is evident in *fishes*, *birds*, and all other *Oviparous* creatures, whose males are all replenished with seed, at the same time, and place, whereat their *females* do conceive their *egges*.

And therefore all those parts of the *Hen* which are designed to *Generation*, namely, the *Ovary*, *Infundibulum*, the proceß of the *Womb*, and the *Womb* it self, and the *Privities*: and also the *situation*, *fabrick*, *quantity*, and *Temper* of all these, and whatsoever else relates thereto: they are all inservient, and handmaids either to the procreation of the *EGGE*, or to its *Augmentation*, or else to *Coition*, and fertility received from the Male, or to the *fetus*: to which they conduce either necessarily and principally, or as a *Causa sine qua non*, or some way or other to the better being.

For there is nothing made either vain or rash in  
all



all the operations of Nature. So likewise all the Genital parts in the Cock are contrived for preparing or concealing, or else transmitting the geniture into the Hen.

But such males as are so vigorous, that they can supply many females, these do much exceed their females in their growth, and stature, as also in their ornaments, courage, and weapons; which is not so eminent in those that are conjugal and chaster. For a cock-Partridge, Crow, or Pigeon, are not so much superiour and different from their consorts, as the Cock is from the Hen, or the Stag from his Hindes.

And therefore the Cock, as he is well appointed in his weapons, brave in his plumes, haughty, ambitious, valiant, and a famous Duellist; to doth he also abound in Seed, and is swift in his chamber-offices, and of so unbounded a luxury, that (except he have his Seraglio for his concubines) he will tire out his wives by frequent invitations, and compressions, and (as we have observed in the Pheasant, the Turkey-cock, and others) will cruelly handle them, with unseasonable advancements, and molestations. I have seen Hens sometimes so tired and torn by the insolency and incivility of the insatiate Cock, that all their backs have been deplumed, and they themselves by deep ulcerations piercing to the bare bone, have miserably expired.

## Of the Henne.

## EXER. XL.

**T**Here are two first *Causes* and *Instruments* of *Generation*, the *Male* and *Female*. For the *Hen* seems to be the *Author* of the *Egge*, as the *Cock* of the *Fertility*: and therefore by the *coition* of these two, that which renders the *egge* fruitful, is traduced from the *Male* into the *Female*, or generated in the *Female* by that *coition*.

But what that is, is no less difficult to be known, then to what it is communicated: namely, whether to the whole *Henne*, or to its *Uterus*, or to the *Eggs* already made, or else to all the *Egges* now begun in the *Ovary*, or to be begun hereafter? For it is probable, according to our former discourses, and also by *Fabricius* his experiment, that a few *coitions*, and the commerce of the *Henne* with the *Cock* for a few dayes, doth sufficiently fructifie her, or her *womb* at least, for a whole year together. And I my self, informed by experience, can partly affirm the same thing; namely, that the twentieth *egge* layed by the *Hen* (after her divorce from the *Cock*) hath been fruitful, and *prolific*. That as from the *geniture* of the *Male-fishes* scattered in the *water*, a great family of *eggs* is endowed with *prolific* virtue; and as in *Bitches*, and *Sowers*, and also other *Animals*, some few *coitions* have satisfied to the *fertility* of several *fatufes*: (insomuch that some think it an approved *Maxim*, that in case a *Bitch* be oftner compressed by the *dog* then three or four times, it will wrong her *fertility*, and make her births degenerate most into *females*) so  
also

also the *Cock* by some few familiarities with the *Hen*, doth not only render the *egge* now being in the *Ovary*, but the entire *Ovary*, and *Hen* her self *prolificall* (as hath been often repeated.) Nay, what is more then this, and admirable indeed; In a certain part of *Perfia* (saith *Aristotle*) if you cut up a *shee-Mouse*, you shall finde even the young ones within her, that are females, to be great with young themselves: as being made mothers before they are born: as if the male did not onely fructifie his female, but all the females also of which she labours; as our *Cock* doth not only render his *henne* fruitful, but all the eggs also that she is to lay.

Hist. an. l.

6. c. 37

Now this *Physitians* do confidently deny, who affirme the conceptions of *Animals* to be produced by the mixed *geniture* of both *Sexes*. And therefore *Fabricius*, though he pronounce the *Cocks* seed never to enter, nor to have any possibility of entrance into the hollow of the *womb*, (where either the *egge* is made, or increased) and though he plainly saw, the *egges* now newly begun in the *Ovary*, to be made fertile by the same coition, as well as those *egges* which were already made; no particle of which could be made by the seed of the *Cock*; yet he will needs have the *Cocks* seed (as if its presence and continuance were absolutely necessary) to be locked up for a whole year together in the pouch of a *prolificall Hen*, and there to be reserved in a blinde chink. Which perswasion we have formerly rejected, and that because that cavity is indifferently found as well in a *Cock*, as in a *Hen*; and also for that we could never discover such a standing pool of *Geniture*, either in that cavity, or any other cranny in a *Hen*: but so soon as the *Geniture* hath delivered her message, and performed her trust, by imprinting a *prolificall*

pag. 38.

39.



Arist.  
de gen. an.  
l. 2. c. 3.

Ibid.

virtue in the *Hen*, it either retires back again, or is dissolved, and rarified into air, and so vanisheth. And though *Galen*, and all *Physitians* with him, do strongly oppose this dissolution of the *Geniture*, yet having thoroughly considered the *fabrick* of the genital part by *Anatomical* administrations, and having likewise pondered other most invincible arguments, they must necessarily acknowledge, that the seed of the male, as it is derived from the *Testicles* by the leading vessels, and contained in the *spermatical* vessels, is not *prolific*, unless by the fervency of *Coition*, and desire, it become *aerial*, and rarified into a *spume*. For (witness *Aristotle*) it is not the corpulency of the seed, or its fire, that renders it *prolific*, or any quality like to those, but the spirit which is inclosed in the seed and spumous body, and the nature which is in that spirit, being answerable and like in proportion to the Element or substance of the Stars. Wherefore, though wee should indulge *Fabricius* in his opinion, that the Seed is reserved in that pouch; yet notwithstanding, after the *prolific* effervency, or the spirit is resolved, it would grow useles, and *improlific*. And from hence may *Physitians* take notice, that the *geniture* of the male is not therefore the architect of the *fetus*, because the first conception assumes its body from it, but because it is *spirituous*, and boyling, as being inspired with a *fertile spirit*, and turgent like a thing possessed. For otherwise *Averrhoes* his fable, of the woman that conceived in a Bath, might have some title to true story. But of these things more in their proper place.

As therefore the Egg is made by the *Hen*, so is it also very likely that all the first conceptions (as shall be shown hereafter) doe assume both their Matter and Form from the female; and that also,  
after

after the *males* *geniture* is immitted, and now for some time quite departed and vanished away. For the *Cock* doth not conferre any *fertility* to the *Hen* or *Eggs*, by the bare emission of his *geniture*; but onely so farre forth as that *geniture* is *prolific*, and impowered with a *plastical* *virtue*; that is to say, *spiritous*, *operative*, and *proportionable* to the substance of the *Stars*. The *male* therefore is no more to be prized as the chief principle of the *conception*, and *fecundus*, by reason he can concoct and emit *seed*, then a *female*, which can produce an *egg* without his help. But he therefore rather claims prerogative, in that he impowers his *seed* with *spirit*, and divine efficacy; and so, that in a moment it can perform its affaires, and convey *fertility*. For as we see things immediately set on fire, and inflamed by a *spark* struck from a *flint*, or by a *flash* of *Lightning* from a *cloud*; so the *geniture* of the *male* doth immediately affect the *female* with the touch, and transferres *fruitfulness* unto her, which doth not onely virtuate the *eggs*, but the *womb* also, and the *Hen* herself, and all in an instant: for no combustible substance is sooner set on fire by the approach of the flames, then the *Hen* is made pregnant by the *coition* of the *Cock*.

But what it is that is transferred from him to her, we shall have occasion to discover in its order, when we shall determine the matter more perspicuously and in general.

In the mean time we must take notice, that if it be derived from the soul (for it is most likely that whatsoever is *fruitfull*, the same is also animate, and we have said before, that an *Egg* in *Aristotles* opinion is indowed with a *vegetative* *soul*, as also all the seed of *Plants*) that soul (at least the *vegetative*) must of necessity be ex *traduce*, and derived

from the Male into the Female, from the Female into the Egge, and from the Egg into the Fetus; or be ingenerated in each of them successively, by the contagium, or contact of coition.

de gen. an.  
l. 3. c. 1.

Yet neverthelesse the disquisition seems full of ambiguity: and therefore though Aristotle grant, the Geniture of the Male to be of so great a vertue, that being but once onely infused, it sufficeth to the fertility of many Egges; yet least repeated coition might seem vain, he saith, In Birds those very egges that are produced by coition, cannot for the greater part encrease and grow, except coition be continued to the Bird. And the reason is, because as in Women the Menstruous excrement is attracted by the Coition of the Male (for the Womb being heated, doth attract, and the passages are opened) so is it in Birds, while the Menstruous Excrement comes down by degrees, which cannot get out, because it is but little in quantity, and is retained above, about the Diaphragma, but falleth into the Womb it self. For this is that which augments the Egg, as that which floweth by the Navel, augmenteth the Fetus of Viviparous Animals. For when once Birds have bin at Tread, they persist to have almost all their Eggs, but those very smal. So far perhaps Aristotle may be in the right, that repeated Coitions may procure more, & fairer Eggs, because more plenty of Matter may flow to the Womb (by its being tepified by coition) but yet it is not necessary to the Prolification of the Eggs, that the coition should be often repeated.

For experience declares the contrary, and the reason which he alleages, doth no way inforce it: for the Rudiment of Eggs is not derived from Menstruous Blood (which indeed is no where to be found in a Hen) but egges are generated in the Ovary (where there is no preexistent blood at all) as well with-



without the cocks treading, as with it.

The Hen (as all other Females) administers Matter, Nutriment, and place to her conception. Now the Matter from whence the Rudiment of all the Egges in the Ovary doth spring, and increase, seems to be the very same with that out of which all the other parts of the Hen are nourished, and grow, namely the flesh, nerves, bones, also the head, and the rest of the members. For Aliment is conveyed to every Papula or Whelke in the Ovary (after the same manner as to the other parts of the Hen, namely, by the Vessels: and the place where the egge is divided by Membranes, and perfected by the Grandines, and the shell, is the Uterus, or Womb.

But that neither the Hen doth emit any Seed in coition, nor poure forth any blood at that time into the cavity of the Uterus; as also that the egge is not formed after *Aristotles* way; nor yet (as *Physicians* suppose) by the commixture of Seeds, and likewise that the Cocks seed doth not penetrate into the hollow of the womb, nor yet is attracted thither, is most manifest, from this one Observation, namely, That after coition there is nothing at all to be found in the Uterus, more then there was before. Which thing, when it shall anon evidently be proved, and when we shall also have demonstrated, that it is true likewise in all the kinds of Animals which bring forth young, it will then also be as evident that all those things which have hitherto been delivered to us from all Antiquity, concerning the Generation of Animals, are erroneous: and that the *fetus* is neither made of the Seed of Male or Female, nor of the mixture arising from them both, nor yet of the Menstruous Blood: but the thing is one and the same in all creatures (as well

in a *Prolificall* Conception as after it) as it is in the Generation of the Chicken out of the *Egge*, and just in that manner as *Plants* do spring from seeds of their own kind. For it doth not appear that the Male is required, to the intent that hee should be as an Agent, Operatour, or Efficient *per se*, nor that the Female, is required that she should contribute the matter; but both Male and Female are to be esteemed in some sort the Operatour, and Parent: and the *fetus* is procreated a mixt similitude, and resemblance, as if it proceeded from both mixt together. Nor is it true which *Aristot<sup>e</sup>* often affirms, and *Physitians* take for granted, namely, that presently after Coition, there is something to be found of the *fetus*, or conception, (as the *Heart*, or the *Tres Bullæ*, or some other Principle part) or something at least in the cavity of the Womb, as some *Coagulum*, or *Spermatical* mixt substance, or the like. But on the contrary, in case the Female prove fertile, and pregnant, it happens that the *eggs*, and *conception* in the most, and most perfect creatures, is first begun long after coition. And that the Female also is *prolificall*, before any thing of the conception be at all contained in the Womb, many indications do conspire to ascertain, as shall be afterwards discovered in the *History of Viviparous Animals*: as the enlargement of the Breasts, and the turgid swelling of the Womb, by which and other Symptomes we may perceive an *Alteration* in the whole Body.

But as for the *Hen*, though she have for the most part the Rudiments of *eggs* in her before coition, which are afterwards by the Tread made *prolificall*, and therefore she then hath something in her presently upon coition, or treading: yet when it falls out

out so with her, that like other creatures, she hath nothing at hand ready in her *Ovary*, or hath already layd all the *eggs* she formerly had there; she being afterwards trod (though some time pass between and intervene) as if she were then both *Principles* her self alone, or did possess the power of both Sexes, doth after the manner of *Plants* generate eggs by her self, and those too (I speak it knowingly) not *subventaneous*, but *proliferical*.

For if you take all the *eggs* from under a *Hen* that is now sitting, in case that very *Hen* was a fruitful *Hen* in former time (though she have now already layd all the *eggs* she hath, and have not so much as one remaining in her *Ovary*) she will lay again, and those eggs shall be *fructifying*, *proliferical* eggs, having the principles of both Sexes in them.

---

*In what respect the Henne may be called the Primum Efficiens, the first or Chiefe Efficient. And also of her issue.*

EXERCIT. XLI.

WE have already pronounced the *Hen*, to be an *Efficient Cause* of *Generation*, or *natures Instrument* in that employment; (but she is not absolutely, and *per se*; but by commission, and by vertue of the Male rendered *proliferical*.) But as the Male is by *Aristotle* counted the first principle of *Generation*,



*Generation, suo merito*, upon his own score, because the first *Motus* or progress towards *Generation* proceeds from him; so the *Hen* also may in some respect be esteemed the first cause of *Generation*; in so much as the *male* by the approach and presence of the *female*, like one possessed, is inflamed to *Venerary*. The *female-Fish* (saith *Pliny*) at the time of coition will pursue and follow the *Male*, punching his belly with her head: And again, about the time of bringing forth, the *Male* will do the like to the *Female*. I my self have sometimes seen the *male* *Fishes* follow the *female* that was ready to spawn, (just as *Doggs* doe a *salt-Bitch*) all in troops, that they might sprinkle her eggs so soon as she had laid them, *lacte suo*, with their milkey substance, or seed. But that is most sensible in wanton and lascivious *females*, which will stirre up *Cupids* flow and drowie fires in their tame *males*, and instill a silent love into them.

Lib. 9. c.  
50.

And hence it is, that the *Dunghill-cock*, so soon as ever he sees his own spouse whom he hath misfed never so little a while, or any other stranger *Henn*, being presently arrested at *Cupids* suite, he mounts her. And likewise when he is *Victor* in fight, though he return wounded and wearied from the battel, yet he still delights to ravish his captives wives. And that he may kindle this declining spark of lust, which now lyes expiring in his breast, into a vigorous flame, with several *gesticulations*, incitements, and *Love-scenes* (while he often crows, assembles his *Henns*, and now approaching circuits about them, and trailes his stiffe wings at their feet) he enticeth his *Females*, as by a spell or enchantment, to sport with him. Now these are the *Cocks* projects and arts: but sometimes the coyness and morosity of the *Hen* doth

doth not a litle conduce to rouse and heighten the males sleepy heat, and languishing appetite, to quicken and encourage his performance. But of these provocations and allurements, so farre as they serve to promote conception, we shall speak more anon. For if you carefully ponder Natures works, you shall finde none of them made in vain, but all directed to some end, and for some good.

Almost all females are pleased & delighted with the act of *coition*, and rejoyce at their great bellies, but many groan at their delivery. But the thing is quite contrary in *Hens*, which in *coition* complain, and hang back; but in *laying*, though the Egge be very great in comparifon of their own bulk, and the streights of the *Uterine Orifice*, and the Egge brings no furtherance at all to his own release, (as the Issues of *Viviparous animals* do) yet she brings forth without any pain, and still rejoices as soon as she hath *layd*, and raising a loud laughter, invites in the Cock to share in her triumphs.

But though there are many rudiments of eggs, of different magnitude, and degree, in the *Hens Ovary*, insomuch that some are augmented and come to maturity before others, yet they all seem to be fructified alike, and receive the prolificall stamp together, by the Cocks *coition*.

And though a good space of time pass away (namely, thirty dayes or more) before the Common-ben or Partridge-ben disburden all the Egges in their *Ovary*, yet when ever the *Hen* sits upon them, they bring forth all their *chickens* almost together, at the set time (namely, in the compass of twenty, or two and twenty daies) and they are all likewise no less complete, then if they had all taken

ken the same rise and original at the same instance of coition (as the Bitches *whelps* do.)

And being upon this contemplation, while I consider how small the *prolific* ground-works of Eggs are, namely little *whelks*, and exudations, less than the seeds of *Millet*; and meditating the stature, magnanimity, and furniture of the *Cock* who is born from thence; I cannot but admire, that Nature should intrust such great abilities to so slender beginnings: and observe, how the *Omnipotent Creator* is pleased to manifest his greatness most, in the smallest originals.

Lib. 17. c.  
10.

For the *Hen*, and the *Cock*, that haughty and magnificent Animal, springs from a small and almost invisible *whelk*. A vast Tree rises from a little *Acorn*. Nay, from the smallest bud and point of an *Acorn*, how doth the Aged *Oak* display her spreading armies? how lofty a crest doth she exalt to heaven? and how deep a root doth she send down to fathom the earth? It is indeed (saith Pliny) an incomprehensible miracle, that a substance which defies the axe, that presses, undaunted at the hugest weights, that masts patient of the largest sails, and ramms unbattered by the shock of Towers, and Bullwarks, should proceed from so mean principles. But this is Nature's power, this her ability. Now there is such a little sprout in the seeds of all Plants, whose bare top of all no bigger than a point, if it be once pared away, all hope of generation presently dies, as if the entire *plastical* virtue that is to fashion and compose the whole Tree, did take up its abode in so small a point. And therefore the provident *Ant*, eating of this small particle before hand, doth safely treasure up the grains and seeds of corn in her barns that lye under ground, cunningly



ningly providing by this meanes against the inconvenience which the might suffer in their growing afresh. The Cypress-Tree (saith the same Pliny) beareth a seed exceedingly affected by the Ant; and this enlarges the miracle, that so inconsiderable an Animal should devoure and destroy so vast a Tree in its cradle. But of these also in general we shall speak more, when we shall shew that many Animals themselves, especially Insects, do germinate and spring from seeds and principles not to be discerned even by the eye, by reason of their contract invisible dimensions, (like those atomes, that fly in the aire) which are scattered and dispersed up and down by the winds: all which are esteemed to be Spontaneous issues, or born of Putrefaction, because their seed is not any where seen. And this speculation is useful to that Philosophy, which teacheth, that all things are made out of nothing; for between the Original, and the Complement of any Living creature, there is almost no commensurable proportion.

Nor are we so much to admire, what it is in a Cock, that doth conserve and govern so perfect and noble a creature, and is the first cause of his existence, which we say is his soul: but farre more what it is in the egge, nay in the very whelk, which hath so grand an authority to produce so gallant an animal, and advance its own renown to so high a stretch of glory. Nor are we only to admire, how great the Artist is that doth assist and cooperate in so great a work; but rather the manner of conveyance, it being by the contagion of onely a momentary cotion: namely, what the thing is that passeth from the Male to the Female, from the Female to the Egge, and from the Egge to the Fetus? What it is, that is *hoc Traducis*, this Derived essence,

essence, which cannot be perceived to be either remaining, or touching, nor any sensible contained thing; and yet doth operate with a vast discretion and providence, beyond all the bounds of Art: & which doth render the Egg *prolific*, even when it selfe is fled and vanished, not because it now doth, or hath touched before; not fructifying only the perfect, and absolved eggs, but even the imperfect and intended only, when they are yet but *whelks* and *pushes*: nay the *Henne* her self, before she have yet produced any *whelks* at all, and that so nimbly, as if the *Almighty* himself should say, Let there be a production, and strait there is one.

Let *Physitians* therefore cease to wonder at what they do not finde, but with astonishment; namely, at Contagious, Epidemical, and Pestilential Diseases, how they do foment and disperse their infection through the air, and propagate distempers like to themselves in other bodies, and by a secret course, as it were, by a solemn generation tacitly multiply, and grow sometimes so destructive, that (if God would leave the reins in their own hands) they would spread a sweeping desolation over *Men*, and *Beasts*: for greater things then these are the dayly results of the generation of *Animals*. For more, and abler operations are required to the Fabrick and erection of *Living creatures*, then to their dissolution, and plucking of them down: For those things that easily and nimbly perish, are slow and difficult in their rise and complement. *Seneca* (as he is wont) elegantly saith: *How long a time is required to ripen the conception for the Birth! With how great care and tenderness is it trained when now it is an Infant! With what choice of aliment is it cherished to a Youth! and yet how obnoxious is this carcase at last! how lost without*

Nat. quest.  
l. 3. c. 27.

without any paines ! An age builds Towers, which one hour levels with the ground. With great caution things continue, but perish at an easie rate. The Forrest which is growing long, one active spark and moment turns to cinders. Nay, not so much as a spark ; for the conflagration of the vastest bodies, will put us onely to the expence of a Burning-glass, where the Sunne beames being assembled, and directed in a Cone, will raise a nimble flame to speed the mischief. So that nothing is difficult to Natures Royalty, which to the production of things is sparing of her power, and warily dispenseth it with a great deal of thrift, by insensible accessions ; but she is quick to destroy, running in full speed. In the generation of things, the best, eternal, and omnipotent God, or Natures deity, is evidently seen ; but all mortal things finde out a thousand wayes to ruine, of their own accord.

*How the generation of the Chicken  
is procured out of the Egge.*

EXER. XLII.

WE have thus farre considered the Egge, as the Fruit, and End : it remaines, that wee now treat of it, as the Seed, and Principle. Now we must enquire (saith Fabricius) how the generation of the Chicken follows out of the Egge ; taking our rise from that Principle or Position of Aristotle and Galen, and approved by all : namely, That all things that are made in this world, are produced of these three ;

the



the Agents, the Instruments, and the Matter. But because in natural Productions, the Agent is not without, but either existent in the Matter, or Instruments, he concludes, That we are to consider of the Agent, and Matter only.

But because we are here to shew after what manner the Chicken is made out of the Egge, I conceive it not useles, to demonstrate, how many several wayes one thing may be said to be made out of another: for by that means it will more clearly and distinctly appear, how many several wayes generation doth proceed from an Egge, and what is to be resolved, concerning the Matter, Instruments, and Efficient.

De gen. an.  
l. i. c. 18.

Aristotle hath taught, that one thing is made out of another four manner of wayes: First, when we say the Night is made out of the Day, and a Man of a Boy; because this is after that. The second, when a Statue is made out of Brass, or a Bed-stead out of Wood, or whatsoever we affirm to be made of matter, that so a whole may result, from something that is formed, and in it. Thirdly, when of a Musick, a man unskilled in Musick, or of a Sound, a Sick man, or one contrary of another. Fourthly, as Epicharmus makes his exaggeration: of Calumnies, Cursings; of Cursings, Conflicts. All which are referred to the first beginning of the progress; for the Calumnies are a certain part of the whole Broile. Since therefore one thing may be made out of another so many wayes, it is apparent, that the Seed is in another, two of these wayes. For that which is begotten, is out of it, either as out of its matter, or as its first mover. For it is not barely, as this thing is after that, as Navigation after the Panathenæa, nor as one contrary out of another; for a contrary is begotten out of the corruption of a contrary, and there must needs be some subject matter, out of which, as out of a first  
immanent

immanent thing it should be made. By which words Aristotle truly inferres, that the Seed proceeding from the male, is the efficient cause of the *Fetus*, or else the *Instrumental*; because it is no part of the *Fetus*, neither according to the First, nor third acceptation (namely, as this thing out of that, or as out of its contrary) nor is it the *subject matter*.

But, as he saith in the same place, that which proceeds from the Male in coition, is not truly and properly called *Seed*, but *Geniture* rather, and doth differ from *Seed* properly so called. For that is called *Geniture*, which proceeding from the *Generant*, is that first cause which obtains the beginning of the generation; namely, in those creatures which Nature hath designed to generation: but the *Semen* is that thing which takes its original from the coition of those two (namely, the Male and Female:) and such is the seed of all Plants, and of some Animals, in whom there is no distinction of Sex: as being that which is first mixt by the Male and Female, as it were a promiscuous conception; and such as we have formerly in our History declared the Egge to be, which is called both a *Fruit* and a *Seed*. For the *Seed* and the *Fruit* are distinct things, and differ ratione prioris & posterioris, under the notion of that which is first, and that which is after; for the *Fruit* is that which proceeds from another, the *Seed* is that out of which another doth proceed; otherwise they were both the same. It remaines therefore that we enquire, how many of the foresaid wayes the *Fetus* doth proceed, not from the *Geniture* of the Male, but from the true *Seed*, or *Egg*, or *Conception* (which are truly the seeds of Animals.)

P

How

*How many waies the Chicken  
may be said to be made out  
of the Egge.*

EXERCIT. XLIII.

**I**T is therefore granted, that the *Chicken* is made out of a *prolificall Egge*, as out of its *Matter*, and as by its *Efficient*; and that the same *Egge* is both the *Causes* of the *Chicken*. For as it deduceth its original from the *Hen*, and is esteemed the *fruit*, it is the *Matter*: but in as much as it containeth in it, throughout all its substance, a *plastical*, and *prolificall* virtue infused by the *Male*, it is called the *Efficient* of the *Chicken*. So that not onely (as *Fabricius* would have it) these things are inseparably joyned together in one and the same *Egge*; namely, the *Agent*, and the *Instrument*, but it is also necessary, that the same place should also containe *Aliment*, by which it should be nourished. So that in a *prolificall Egge* these four things are to be found together; namely, the *Efficient*, the *Instrument*, the *Matter*, and the *Aliment*, as appears plainly in our History.

Wherefore we affirme, that the *Chicken* is made out of the *prolificall Egge* all the fore-said waies; namely, as out of its *Matter*, *Efficient*, and *Instrument*: and also as a *Man* is made out of a *Body*, and the *Whole* out of a *Part*: and also *tanquam ex Alimento*, as a thing may be said to be made of its nutriment; and likewise as a *contrary* is made out of a *contrary*.

For when by *Incubation* (by the *Internal motive principle*) some clear part is liquefied (which we call *Ovi Oculum* the *Eggs-Eye*) we say that very thing



Ex. XLIII. *be said to be made out of the Egg.* 211

thing is made *tanquam ex contrario*, as a contrary out of a contrary: as we suppose the *Chyle* to be made out of *contraries* by *concoction*; (namely, out of crude, unconcocted meats) and in the same sense, as we our selves are said to be nourished by contraries. Just in that manner is the *Colliquamentum* and the *Oculus Ovi* made of the *White*, and augmented: and in that manner likewise is the *Blood* and the *Vesicula pulsans* (which are the first particles of the *Chicken*) made, nourished and augmented, out of that white liquor, or *Colliquamentum*: nourished I say, the Nutrimēt being *assimilated* by *concoction* (as out of its *contrary*) by the power of the *innate heat*; for that which is *crude* and *unconcocted*, is *contrary* to that which is *concocted* and *assimilated*: as a *Man unskilled* in *Musick* is *contrary* to a *Musitian*; and a *Sick man*, to a *Sound*.

And when *Blood* is made out of the white *Colliquamentum*, or the *Colliquamentum* out of the *Yolk* or *White*, it is called the *generation* of the one, and the *corruption* of the other: there being an *alteration* made from the *contrary* to the *contrary*, the same *subject matter* remaining still. For the proceeding form of the *White* being corrupted, the *Colliquamentum* ariseth: and from the *privation* of the form of the *Colliquamentum*, resulteth the form of *Blood*: in the same manner as *nourishment* is turned into the *substance* of that which is nourished.

Therefore in this sort the *Chicken* is said to be made out of the *egge*, *tanquam ex Contrario*, as out of a *Contrary*. For the *Chicken* being nourished and increased in the *Egg*, both the *Yolk* and the *White* are corrupted and consumed, and afterwards all the substance of the *Egg*. It is therefore manifest

nifest that the *Chicken* is made out of the *Egg*, as out of a *contrary*, namely, as out of *Aliment* : and also, *tanquam ex privatione*, & *non ente*, as out of a *Privation* and *non Ens*. For the first particle of the *Chicken*, (namely the *Blood*, or *Punctum saliens*) is made *ex non sanguine*, of that which is not blood, and altogether its *contrary*, the same *subject Matter* still remaining.

The *Chicken* also is made out of the *Egg*, *sicut vir ex puero*, as a *Man* is made out of a *Boy*. For as out of *Plants Seeds* are made, out of *Seeds*, *Blossoms*, *Sprouts*, *Stems*, *Flowers*, and *Fruits* : so also out of an *Egge*, (which is the *Hens Seed*) is made the dilatation of the *Macula*, the *Colliquamentum*, the *Blood* and *Heart*, as the first particle of the *factus* (or *fruit*.) And that, *tanquam ex nocte dies*, as the *Night* is made out of the *Day* ; the *Sommer* out of the *Spring* ; and a *Man* out of a *Boy* : Where this thing, is after that. So that as the *Fruit* doth arise in the same *Stem* after the *Flowers* ; so likewise, after the *Egge* the *colliquamentum* ; and after that, as out of the *Humor Primigenius*, out of the radical first moisture, the *Blood*, after the *Blood*, and out of it, the *chicken* ; as the *Whole* out of a *Part*. And again, as by *Epicharmus* his Exaggeration, *ex calumniâ fiunt maledicta*, & *ex maledictis pugna*, out of *slander* come *cursings*, and out of *cursings* fighting. For the *Blood* together with the *Punctum saliens* is first existent ; and doth likewise seem to be a part of the *chicken*, and a kind of *Efficient*, or *Instrument* of its *Generation*, inseparable from the *Agent* : (as *Fabricius* supposeth) Now, in what manner the *Egge* may be called the *Instrument* and *Efficient* of *Generation*, is in part shewed already ; and shall appear more at large hereafter.

It is evident out of our *History*, that the *Punctum saliens*

*saliens* and the *Blood*, (while they increase) do assemble the rest of the *body* and all the other members of the *chicken* to themselves: as the *Yolk* in the *Womb*, descending from the *Ovary*, encompasseth it self with the *White*, and that by way of *concoction*, and *Nutrition*. Now all men conceive *calor innatus*, aut *calidum innatum*, the innate or primigenial *Heat*, or *Spirit* diffused through the whole, and the *Soul* in that *Spirit*, or the faculty of that *Soul*, to be the common *Instrument* of the *Vegetable Operations*. The egg therefore without all question hath its *Operative soul*, which is all in the whole, and all in every part; and contains a *spirit*, or *Animal heat* in it, which is the immediate instrument of that soul.

If any man therefore ask, how a *chicken* is made out at the *egge*? We reply, after all those ways recited by *Aristotle*, or invented by any else. after the which, one thing may be made. out of another.

---

*Fabricius is mistaken concerning the  
Matter of the Generation of the  
Chicken out of the Egge.*

EXER. XLIV.

AS I decreed with my self from the beginning, pag. 28.  
so I shal continue to take *Fabricius* along with me in my progress: and therefore we shall consider with him of those three things, which he saith are to be inquired after in the *Generation* of the



*chicken*, namely, the *Agent*, the *Matter*, and the *Aliment* of the *chicken*. All which ought to be in an *egge*, concerning which he proposeth some doubts, together with the opinions of Authors, who are of another mind. The first doubt relates to the *Matter* and *Aliment* of the *chicken*. Indeed

*De Nat. pueri.* Hippocrates, Anaxagoras, Alcmaeon, Menander, and all the ancient Philosophers, did conceive the

*Chicken* to be born out of the *Yolk*, and nourished by the *White*. And Aristotle and Pliny, contrary to that opinion, did believe, that the *chicken* did assume its body from the *White*, and its *Aliment* from the *Yolk*. But Fabricius for his own part,

*Hist. an. l. 6 c. 3. and De gen. an. l. 3. c. 1. & 3. l. 10. c. 53.* conceived neither *Yolk* nor *White* to be the *Matter* of the *chicken*: endeavouring to confute the former opinions, and to shew, that both *Yolk* and *White* did serve to nourish the *Chicken*. And this, besides other Arguments (which I conceive to be of less force) with this which is evincing enough, namely that the propagations of the *Umbilical Vessels* (by which without doubt the *chicken* doth attract his *Aliment*) are disseminated both into the *Yolk* and *white*, and that both those liquors (accordingly as the *chicken* encreases, and doth expend a greater stock of nourishment) are quite exhausted. And hereupon Fabricius for confirmation of his opinion, saith: There are three onely substances which do conduce to the fabrick of the egg, and the generation of the *chicken*, the *White*, the *Yolk*, and the *Chalazæ*: the *White* and *Yolk* are the *Chickens substance*; therefore the *Chalazæ* onely are the subject matter of the *chicken*. But that the most excellent Fabricius is in an error, we have demonstrated before in our *History*. For after the *chicken* is well nigh compleated, when his *Head* and *Eyes* are distinctly to be seen, the *Chalazæ* are still

pag. 34.

found

IV.  
the  
be in  
some  
horns,  
plates  
indeed  
and  
the  
filled  
rary  
did  
ment  
part,  
later  
for-  
and  
this,  
to be  
ough,  
ly of-  
th at-  
to the  
(ac-  
th ex-  
te ex-  
mati-  
ly sub-  
eg, end  
Yolk,  
re the  
ly are  
most  
emon-  
chic-  
d and  
re still  
found

Ex. XLIV. generation of the *Chic.* out of an *Eg.* 215

found in the *Egg* far remote from the *Chicken*, and still entire, being then depressed from the two ends of the *egg* to the sides, and do execute (as he also confesses) the office of *Ligaments*, to keep the *Tolk* in its true position within the *White*. Nor is that true neither, which *Fabricius* addes to justify his perswasion; namely, that the *Chalazæ* are seated directly under the *Obtuse Angle* of the *EGGE*. For after the first days *Incubation* the *Liquors* shift their stations; the *Yolk* is exalted, and the *chalazæ* are depressed from both ends, as hath been said.

He is also deceived, when he saith that the *chalazæ* are parts of the *Eggs*: for in truth, the *eggs* is constituted onely by the *Yolk*, and the *White*; but the *chalazæ*, as also the *membranes*, are onely certain litle *Appendixes* of the *White*, and nothing else but meerly the *extremities* of the *membranes* contorted and twisted, (as *filaments* or *strings* are twisted into a *Rope*) that so they may the better preserve the *Liquors* in their proper places, by a firmer tye.

And therefore his Inference is infirme, when he saith: *The chalazæ are found to be in that part of the egg where the chicken is made, and therefore the chicken is made out of them.* For even according to *Fabricius* himself, that can no wayes be: who confesses, that the *chalazæ* are to be found in the two extremities of the *egg*, and yet denies, that the *chicken* is any where made, but onely in the *Obtuse end* of it: in which end truly, from the very first setting out towards the Generation of the *Chicken*, there is no *chalazæ* to be found at all. Nay, if you make tryal in a *New-layd Eggs*, you shall find that the superiour *chalazæ* is not directly seated under the *Obtuse end*, or the cavity thereof,

but inclining something to the side; nor on that side neither, where the *cavity* doth tend, but rather on the contrary side. Moreover, it hath been shewed before, that the situation of the *Liquors* immediately upon *Incubation* is shifted, because the *Oculus*, or *Eye* of the *egge* being enlarged by the *colliquamentum*, is exalted to the *cavity* in the *Obtuse Angle*, upon which the *liquors* and *chalazæ* at each end do remove to the *sides*. For the *Macula* or *Speck*, which before *Incubation*, was seated in the midst between both the extremities of the *egge*, now being enlarged into an *Oculus*, or *Eye*, is adjoynd to the *cavity* in the *Obtuse end*; and one of the *chalazæ* is deposed from the *Obtuse Angle*, and the other is exalted (so much as the other is deposed) from the *Acute Angle*; (just as the *Poles* of the *World* are seated in an *Oblique Hemisphere*) and at the same time, the greatest part of the *White*, especially of the grosser part of it, doth sinck down to the *Acute Angle*.

pag. 35.

Nor is that true neither where he endeavors to infer a probable argument to prove the *chalazæ* to be the *Matter* of the *Pullus*, from the likenesse & similitude of their consistence, alleadging, that the *chalazæ* do represent the first formation of the *Chicken*, by their figure and longitude, and have also as many twists or knots, as there are principle parts in the *Chicken*.

Nor is that *corpus Rubrum* (which he also took for the *Liver*) or red substance in the *chalazæ*, or any thing neer them, but in the middle of the *colliquamentum candidum*; and it is the rudiment of the *Heart* onely. Nor doth the example of the *Tadpoles* alleadged by him, square to his purpose, of which, saith he, you can onely discern their *Head* and *Taile*, that is, their *Head* and *fine of the Back*, having



Ex.XLIV. generation of the Chick out of the Eg. 217

having neither fore-legs nor hinder-legs. And he proceeds, that whosoever seeth a Chalaza, and one of these conceptions, will think he sees one and the same body.

Now I have made many dissections of these Tadpoles, and have seen a pretty large Belly in them, and in that Belly Guts, and a Liver, and a Heart panting; and also I have discovered their Head and Eyes too. But that which Fabricius takes for their Head, is their round figure, from which they are called *Gyrini*; because their form or figure in *gyrum vertitur*, curls into a round. They have also a Taile by which they swim, but legs indeed they want. Yet about the Solstice, they lose or cast their Taile, having then hinder-legs, and fore-legs beginning to strut out. Now there is nothing in the first division of a Chicken into his Head and Spine, that any way resembles this; which should any way induce us to believe that the Chicken is made out of the Chalaza, in manner of a Tadpole.

To proceed farther in the confutation of this matter, the worth of Fabricius (a man so exceedingly well skilled in Anatomy) forbids: nor indeed is there any great need, since the thing is so evident in our History. He at last concludes, that this his opinion is wondrous old, and was on foot in Aristotles dayes. But I rather think the opinion of Ulysses Aldrovandus to be old, by which it is thought, that the Chalazæ are the Cocks Tred-dle, out of which, and by which the chicken is pro-created.

But neither of these opinions is true: for that the Grandines, or Chalaza (the Italians call them *Galladura*, and our Country-men the Tred-dle) do either proceed from the Cock, or are his seed, is a vulgar

vulgar error, and an old Wifes tale, both heretofore, and in our times.

The *Grandines* (saith *Aldrovandus*) are the *Cocks sperme*, because no fertile *Egge* is without them. No nor infertile *Egge* neither; which he or knew not, or did not declare. And this *Fabricius* indeed acknowledgeth; but while he denyeth the *Cocks seed* to enter into the womb, or to be any where found in the *Egge*; yet he still contends, that the *Chalazæ*, before any other parts of the *Egg*, are chiefly stocked with *fecundity* from the power of the *Males seed*, and do contain a *prolific* virtue; though he could not observe that there is no difference or distinction at all between the *Chalazæ* of the barren & the fruitful *egge*. But seeing he hath granted, that the very rudiments of *Egges* in the *Vitellary* are as well fructified by the *Cocks treading*, as those *Eggs* which are encompassed with the white. I suppose the occasion of his so able a mans error was this: It was hitherto (as we have often said) the received opinion of all *Philosophers* and *Physitians*, that the *Geniture* of the *Male*, or *Female*, or of both together, was the *subject matter* in the generation of *Animals*: out of which residing in the *Uterus* (after coition) the *Animals* are generated (in like manner as *Plants* are made, and spring out of the seeds sown in the ground:) nor was *Aristotle* much distant from this opinion, who would needs have the *menstruous blood* to be the *womans*, which the *Males geniture* doth coagulate, and so constitute the *conception*.

Now the fore-said Error being granted by all, (for an infallible principle) it is no great wonder, if afterwards (according to every mans particular conjecture) many false opinions do creep in. For they

EX. XLIV. generation of the Chick. out of the Egge. 219

they are quite beside their mark, who conceive that after coition some kinde of substance or matter doth remain, fit and convenient for the production of the *fetus*, or first conception; or that any thing else is formed in the cavity of the womb, which may be of like use with the seed which is sown in the bowels of the earth. For it is most certain, that in the *Uterus* of a Hen (and the same thing shall be afterwards evidenced of all females whatsoever) upon coition, nothing is to be discovered, more then was there before.

And therefore it is clear that *Fabricius* is out, when he saith, *As a Viviparous animal is incorporated of a litle quantity of seminal matter, but that which sustaineth him afterward is in a great abundance: so also the litle Chalazæ are sufficient for the generation of the Chicken; but all the other parts contained in the Egge, serve onely for his nourishment.* pag. 35.

By which words he declares, that he conceived such a kinde of substance was at hand in the Egge, for constituting the model of the *fetus*: lest hee should seem to recede any thing from the definition of an Egge, delivered by *Aristotle*; namely, *An Egge is that thing, out of part of which an Animal is produced, and the remainder of which becomes the nourishment for it when it is produced.* Hist. an. l. 3. c. 8. de gen. an. l. 2. c. 1.

And this therefore seemed an invincible Argument to *Fabricius*; Since there are three onely parts in the Egge; namely, the White, the Yolk, and the Chalazæ: and the two first do only administer nutriment to the Chicken; it must needs be that the Chalazæ only are the matter, out of which the Chicken is constituted.

Thus then it fell out, that this able Anatomist (while he sought in the Egge some convenient matter, out of which to constitute the Chicken) being



ing benighted by a vulgar Heresie, lost his way. And this inconvenience doth likewise befall many men more, who forsaking that light, which the frequent *disssection* of bodies, and the familiar converse with *Natures* selfe would help them to, doe yet persist to make discoveries out of their owne conjectures, or some conceived probable arguments, or the Authority of former Writers; when they themselves ought to look into the matter, and assent to it by their own sense. No wonder therefore that infinite errors, which were delivered over by common consent from the first dawning of Antiquity, are handed down even to our times: and that so by that means, men otherwise very ingenious, are egregiously deluded; because they conceive it plentiful satisfaction of minde to them, that they finde it in Books, and have their memories well loaded with *sage* sentences. For they that are thus Philosophers *ex traduce*, by descent and derivation, are just as wise as their owne Libraries.

To conclude therefore, there is in an *Esse* (as we have often said) no distinct part, or disposed matter, out of which the *fetus* may be formed and fashioned: but as in the *seeds* of *Plants*, there is a little point or budding shot out; so is there in an *Esse*, a small *Cicatrice*, or *Macula*, which being inspired with *plastical* endowments, enlarges it self into the *Oculus* or *Colliquamentum*, out of which, and in which, the *primordia* of the *Chicken* (namely the *Blood* and *Punctum saliens*) are ingendered, nourished, and augmented, till they become a complete *Chicken*. Nor is *Aristotles* definition of an *Esse* true, where he will have it to be that, out of part of which the *Chicken* is made, and nourished by the rest; unless you understand it thus: An *Egg*

Ex. XLV. *What the Matter of the Chicken, &c.* 221

is that, out of part of which a Chicken is framed, not as out of its Matter, but as *Vir ex Puero*, a Man is made out of a Boy: or thus; An Egge is a perfect conception, out of which the Chicken is said partly to be made, and partly to be nourished: or lastly thus; An Egge is that thing, whose liquors do serve both for the Matter, and Nourishment of the parts. And in this sense Aristotle teacheth, That the matter of the foetus in women is *menstruous Blood*, which (while it is poured into the womb by the veines) Nature employes it to another use; namely, to the use of Generation, that such another creature may be made, as it would have been; for it is already such in *potentiâ*, in possibility, as the bodies from whence it was separated; that is, the Mothers.

de gen. an.  
l. 2. c. 4.

*What the Matter of the Chicken is,  
and how the Chicken is formed  
in the Egge.*

EXERCIT. XLV.

Since therefore the truth cannot, as I suppose, be attained out of the opinions of other men, (whether they be confirmed by either their naked authority, or probable argumentations) unless wary experience be employed in the discovery: we shal declare to you out of *Natures own Volum*, and clear *Observations*, what the Matter of the *Fætus* is, and how it is formed thence.

I have declared that one thing is made out of another (as out of its Matter) two several wayes, and that as well in *artificial*, as *natural Productions*, but especially in the *Generation of Animals*.

The

The First is, when one thing is made of another thing that is pre-existent; and thus a *Bedstead* is made out of *Timber*, and a *Statue* out of a *Rock*, where the whole *Matter* of the future fabrick was existent and in being, before it was reduced into the subiequent shape, or any tittle of the design begun. But the other way is, when the *matter* is both made, and receiveth its form at the same time. As therefore *Artificial productions* are perfected two severall waies; one, when the *Artificer* cuts and divides the *matter* which is provided to his hands, and so by paring away the superfluous parts, doth leave an *Image* remaining behinde, as the *Statuary* doth: the other, when the *Potter* formes the like *Image* of *Clay*, by adding more stuff, or augmenting, and so fashioning it, so that at one and the same time, he provides, prepares, fits, and applies his *materials*: (and in this way an *Image* or *Figure* may be rather said to be made, then fashioned) so likewise in the *Generation* of *Animals*; some are formed and transfigured, out of *matter* already concocted and grown; and all the parts are made and distinguished together *per metamorphosin*, by a *metamorphosis*, so that a complete *Animal* is the result of that *Generation*: but some again, having one part made before another, are afterwards nourished, augmented, and formed out of the same *matter*; that is, they have parts, whereof some are before, and some after other, and at the same time, are both formed, and grow. Now the *Fabrick* or constitution of these, proceeds from some one part, as from its original, and by the help of that, the other members are produced, and these we say are made *per Epigenesin*, by a post-generation, or after-production; that is to say, by degrees,



Ex.XLV. and how it is formed in the Egg. 223

grees, part after part; and this is more properly called a *Generation*, then the former.

After the former way doth the *generation* of *Insects* proceed, as when by a *Metamorphosis* a *Worm* is made of an *Egge*; or as when out of a putrifying matter (the moisture drying, or the dry part growing moist) the *primordia* or rudiments are generated, out of which (as out of a Canker-worm now grown to its just magnitude, or out of the worm called *Aurelia*) by a *Metamorphosis* ariseth a *Butter-flie*, or common *Flie* in its just magnitude or stature, being nothing augmented since its first birth. But the more perfect *Animals* which have *blood*, are made by an *Epigenesis*, or superaddition of parts, and do grow, and attain their just stature or *ακμή*, after they are born. In those other, *Casus seu Fortuna*, Chance or Fortune, seemeth chiefly to promote the *generation*; in which the form ariseth *ex potentiâ materiæ præ-existentis*, out of the power or potentiality of the pre-existent matter; and the matter is rather the first cause of the *Generation*, then any external *Efficient*. And hence it is, that these kinde of *Animals* are more imperfect, and do less continue their kinde, or are less durable, then *Terrestrial* or *Aquatile* creatures that have *Blood*, which attain a Perpetuity from an *Univocal principle*: (that is, from the same *Species*) the chief cause whereof we ascribe to Nature, and the *Vegetative Virtue*.

Some *Animals* therefore *suâ sponte nascuntur*, are born of their own accord, out of a Matter digested of it self, or else casually, as *Aristotle* seems to assert: *Whose Matter is capable of mutation of it self, undergoing that mutation by Chance, which seed* *Metaphys.*  
doth, in the generation of other *Animals*. And the *l. 7. c. 9.*  
same thing falls out in the generation of *Animals*,

224 *What the Matter of the Chicken is, Ex. XLV.*

as in Art: for some things are accomplished by Art, and those very things, by chance too; as *Health*: and other things againe are never produced without *it*, as a *House*.

Bees, Wasps, Butterflies, and all those creatures, that are generated out of a Worm by a *Metamorphosis*, are said to be *Casus orta*, creatures bred by chance, and therefore things not preserving their kind: but a Lyon, or a Cock, are never made by chance, or of their own accord, but have their existence from *Nature*, or a more divine operative faculty; at whose hands they rather require, that it produce a *Species* like to themselves, then supply a fit *Matter*.

In *Generation* by *Metamorphosis*, creatures seem to be fashioned like things wrought off with a *Mould*, or the *Print* of a *Seale*; where the whole *Matter* is transformed. But an *Animal* produced by *Epigenesis*, attracts, prepares, concocts, and applies the *Matter* at the same time, and is at the same time formed, and Augmented. In those the *Plastical* vertue divides the same similar *Matter*, and being divided, disposes, and reduces it into members; out of a *similar Matter* making a *dissimilar*; or out of a *similar subject Matter*, *dissimilar Organs*. But in these, while it produces diverse parts, and those parts diversly disposed, one after another; it requires and makes a diverse *Matter*, and that *Matter* diversly disposed, or qualified, such as may be convenient to the production of different parts. For which cause we conceive, that the *Perfect Egge* is constituted and made up of several parts.

It therefore is clear by our *History*, that the generation of the *Chicken* out of the *Egge*, proceeds rather *per Epigenesin*, quam *per Metamorphosin*, by

ExXLV. and how it is formed in the Egge. 225

an *Epigenesis*, then by a *Metamorphosis*; and that all its parts are not constituted at once, but successively, & in *Order*; and that while it is augmented it is also formed, & while it is formed, it is also augmented; as likewise that some parts are super-added to others, and distinguished from others; and that the beginning, increase, and perfection of it do proceed by way of growth, till at the last the *Fetus* doth result. For the forming *Faculty* of the *Chicken*, doth rather acquire, and temper its own *Matter*, then find its *Matter* ready tempered, and fitted to its hand; and the *Chicken* seems more to be framed, and increased by his own self, then by any other. And as all things are increased or nourished by the same things, out of which they are made; so likewise the *Chicken* is in all likelihood made by the same thing, (be it the *Soule*, or some *faculty* of the *Soul*) by which he is preserved, and sustained. For the same *Efficient* and *Preserver*, is found both in the *egg* & in the *Chicken*; and out of the same *Matter* of which it doth constitute the first particle or rudiments of the *Chicken*, it nourisheth, augmenteth, and superaddeth all the other parts. Lastly, in *Generation* by *Metamorphosis*, the whole is distributed and distinguished into parts; but by *Epigenesis* the whole is constituted, and made of parts, by a certain order and succession.

Wherefore *Fabricius* did erroneously seek after the *Matter* of the *Chicken*, (as if it were some distinct part of the *egge*,) which went to the embodying of the *Chicken*) as though the *Generation* of the *Chicken* were effected by a *Metamorphosis*, or transfiguration of some collected lump or mass, and that all parts of the body, at least the *Principal* parts were wrought off at a heat, or (as

Q

him-



himself speaks) did arise and were corporated out of the same *Matter*: and not by *Epigenesis*, in which an order is observed according to the dignity, and worth, and use of the *Parts*; where first a small foundation is laid, which at the same time while it doth increase, grows distinct, and formed, and so attains all its parts by degrees, according to their proper order, which are supergenerated, and born to it.

For as the litle *top* or *point* which jets forth or protuberateth from the *Acorne*, taking heat and encreasing, multiplies into a *Root, Wood, Sap, Bark, Shoots, Tendrels, Boughs, Blossoms, and Fruits*, and at last ariseth into a compleat *Tree*: such is the progress of the *Chicken* in the *Egge*; the *Cicatricula* or small speck, which is in the foundation of the future *Pile*, increases in *Oculum*, into an *Eye*, and at the same instant is distinguished into a *Colliquamentum*, or dissolved substance, in whose *Center* is born the *Punctum sanguineum pulsans*, the *Bloody panting point*, together with the *Ramifications* of the *Veins*: from these doth by and by result the *Nebula*, or litle cloudy *Substance*, and first concrete *Matter* of the future *Body*, which also as it grows, is divided, and distinguished into parts, but not all at once, but such as give place and eldership to one another.

To conclude therefore, in the *Generation* of those *Animals*, which are produced by *Epigenesis*, (as the *Chicken* in the *Egge* is) we are not to enquire a particular or distinct *matter*, out of which the productions should be imbodyed, different from that out of which they are nourished and increased: for it is nourished and encreased by the same *matter*, whereof it is made, and so on the other hand, the *Pullus* in the *Egge* is constituted out of the

Ex. XLV. and how it is formed in the Egge. 227

the same matter, by which it is sustained and augmented. And *potentiâ animal*, an Animal in *potentiâ*, is one and the same thing, with *Alibile* and *Augmentativum*, a creature fedde, and augmented in *potentiâ*, (as we shall shew hereafter) and do differ onely *ipso esse* formally, (as Aristotle saith) but otherwise are the very same. For, for as much as this particular thing is, and is convertible into substance, *Nutritivum est*, it is *Nutritive*: and for as much as it is *quantum*, indued with quantity, it is *Augmentativum*, *Augmentative*: for as much as it is substituted in the room of a substance that is lost, *Nutritimentum appellatur*, it is called *Nutritiment*: for as much as it is added to a substance already in being, *Incrementum dicitur*, it is called *Growth*. And the same thing is *Materia*, the Matter in the Generation; *Alimentum*, the *Sustenance* in the Nutrition, and *Incrementum*, the *Increase* in the Augmentation of the Chicken. But that is formally and simply said to be generated, whereof no part was existent before, but that to be nourished and grow which was, and had an existence or being before. That part of the *Fœtus* which is first made, is said to be begotten or born: that which is substituted or superadded to it, is said to be *annate*, *aggenerate*, or born to it. There is in all things the same generation, and transmutation from the same into the same: which is performed in respect of a part, by Nutrition and Augmentation, but in respect of the Whole by Generation: else it is the very same in both. For from whence the first existent matter proceeds, from thence also doth Nutritiment and Growth accrew unto it.

And it shall also appear by that which shall be delivered hereafter, that all Parts of Bodies are nou-

rished by the same *Nutritive* substance diversly transformed or altered. For as all *Plants* do indifferently spring, grow, and are sustained from the same *Common Nutriment*, diversly varied and digested (whether it be Dew, or the juice and moisture of the ground) so likewise out of the same *Liquors* of the *Egge* (namely, the *White* and *Yolk*) the whole *Chicken*, and all its parts are procreated and encreased.

We will then also explaine, what *Animals* are begotten by a *Metamorphosis*: and what kind of pre-existent matter that of the *Insects* is, which spring from a *Worme*, out of which, all the parts are together constituted and concorporated, and at last a perfect *Animal* born, by *Transmutation* onely: as also what *Animals* have any order and degrees in their production, and have their *Parts* produced successively: and what kind of creatures they are which are first borne imperfect, but afterwards shoot up, and attain to perfection, as all those that are produced out of an *Egge*.

These, as they are together made; and augmented, growing; and transformed; and are by a proposed method and order distinguished into parts; so have they no immediate pre-existent Matter (such as is usually designed them; namely, the commixture of the feminine and masculine seed, or the *Menstruous Blood*, or some little portion of the *egge*) out of which the *fetus* should assume his body; but so soon as ever the Matter is made and provided, it grows also, and takes some shape; so soon as there is a *Nutrient*, there is a creature to be nourished by it.

And this *Generation* is rather by *Epigenesis* (as a *Man* is out of a *Boy*) that is, the fabrick and structure of the body is out of the *Punctum saliens*, as

out.



out of its foundation ; as out of the Keel the Ship is built : and rather as the Potter forms an Image, without any *pre-existent Matter* ; then out of any *subject matter* : as the Carpenter forms a Bench out of Boards : and the Statuary a Statue of Marble. For out of the same *matter* whence the first particle of the Chicken , or its least *atome* arises , thence also doth the whole Chicken proceed : whence the first small drop of Blood, thence also is the whole stream or current of it generated in the egg: whatsoever gives a consistence or being to the members or *organical parts* of the body, doth also afford the same to all the *similar parts* likewise ; as, to the *Skin, the Flesh, Veins, Membranes, Nerves, Cartilages, and Bones*. For that very part which was soft and fleshy, at first, is afterward upon its increase, made a *Nerve, Ligament, Tendon*, by the same *Aliment* ; that which was onely a *Membrane* , becomes a *Coat* ; and that which was a *Gristle*, is afterwards advanced into a *Skin* or *Bone* ; and this by the same *similar matter* variously altered. For a *similar mixt body* (which is commonly conceived to be framed out of the *Elements* ) is not made of the *Elements* first subsisting apart by themselves, and then afterwards compounded, united, and altered, but out of this particular mixt body being altered, another mixt body is born and produced, that is, Of the *Colliquamentum* is the *blood* made, of the *blood* the *bulk* of the *body* ; which bulk at first doth appear *similar*, and like the *Spermatical Gluten*, or clammy substance ; but from it the parts are delineated by an obscure indiscernable division at first, but afterwards become *organical* and distinct.

Those similar parts, I say, do not arise from the dissimilar, and heterogeneous *Elements*, united together,

gether, but are framed and discriminated by Generations out of a *similar* substance, and so become *dissimilar*. As if by the Omnipotents command, or fiat, the whole Chicken were created.

As thus : let there be a *similar White* lump, and let that lump or mass be divided into parts, and increased ; and while it is increased, let there be a secretion and delineation of the parts ; and let this part be harder, thicker, and whiter ; and that softer, and well coloured ; And it was so. For thus doth the structure of the Chicken in the Egge proceed daily ; out of one and the same *matter* are all its *limbs* and *members* made, nourished, and augmented. From the *Spine* first do the *Ribs* grow out, and the *Bones* are distinguished from the *Flesh*, by their most white slender *Lines* : three *Bulle* are discernable in the *Head*, which are all fraught with a *Crystalline Water*, being the Rudiments of the *braine*, *After-braine*, and (as by a sprinkled black streak is implied) of one of the *Eyes* : The substance which at first resembleth *coagulated milk*, becomes at last *gristly*, *spinous*, and *bony* : and that which at first was *white*, and *celly-ish* : passeth at length into a *blushing flesh*, and *Parenchyma*. That which was formerly most transparent and pure *Water*, is transformed anon into the *braine*, *After-braine*, and *eyes*. For there is a far greater, and diviner mystery in Generation, then a bare assembling, altering, and compounding of *Parts* : for the *Whole* is made and discovered before its *parts* ; the *Mixed body* before the *Elements*. But of this more hereafter ; when also its *Causes*, and *Principles* come to be assigned.

*Of the Efficient Cause of the Generation of the Chicken, and Foetus.*

E X E R. XLVI.

**T**HUS far of the *Matter*, out of which the *Chicken* springs in the *Egge*: it remains now that we enquire a little with *Fabricius*, concerning the *Efficient cause* of the *Chicken*. But because it is a perplext business, and *Authors* do no where more cavil and contend; and *Aristotle* himself is wonderful intricate in explaining it; and also many doubts, not to be despised, do interpose; I conceive it worth the while, (as we have done in making search after the *Matter*) in the first place to set down, how many ways a thing may be said to be *Efficient*, or *Effective*: that so it may more certainly and distinctly appear, what is to be enquired after under the name of *Efficient*; as also what is to be resolved concerning the opinion of *Authors* about this *matter*: and that it may likewise appear out of our own observations, what is to be truly and properly called an *Efficient*.

*Aristotle* defines an *Efficient cause*, to be that from whence the first beginning of Mutation or Rest proceeds; as an *Adviser*; a *Father*; and simply, he that doth a thing, of the thing that is done; that which is the transmutor, of that which is transmuted. Whereupon many and sundry kinds of causes, from whence a motion or mutation doth proceed, are brought and amassed in the Generation of *Animals*: sometimes an *accident*, or *quality* is assigned

*Metaph. l. 3. c. 2. 88*  
*Phys. l. 2. c. 28.*



the *Efficient*, and so the *animal heat*, and *forming faculty* are alledged, as the *Efficient*. Sometimes an *external substance* before existent, in which the *plastic power*, and *forming faculty* resides; as the *father*, or the *seed* of that creature by whose efficacy the *Chicken* is procreated of the *egge*. Sometimes some *internal substance* existent by it self; as the *spirit*, or *Calidum innatum*. And sometimes some other substance; as the *Form*, or *Nature*, or *Soul*, or some *Vegetative part* of the *Soul*: which kinde of principle, we have said, is in the *Egge*.

Moreover, because some things from which *mutation* doth proceed, are *never causes* of it, and some more *remote*: thereupon sometimes *media*, the things between the first *efficient*, and the last *effect*, and also the *Instruments* are counted *Efficients*: as also *subordinate ends*, or the *principles* of subsequence things, are ranked amongst *efficient causes*; and hereupon is it, that some parts are called *Genital parts*; as the *Heart*, from which *Aristotle* affirms the other parts to proceed, as is clear also by our *History*. I say the *Heart*, or at least the rudiment of the *Heart*; namely, the *Vesicula*, and *Punctum saliens*, doth erect and set up the rest of the *Body*, as a future *habitation* for it self: and when it is built, takes possession, enlivens, and sways it, and fortifies it with the superaddition of the *Ribs*, and *Breast-bone*, as with a *Bulwark*: and becomes, as it were, a *Tutelar God*, the first *chamber* that entertaines the *soule*, the first *receptacle* of the *primigenial heat*, and the *Vestal animal-fire*; the source and fountain of all the *Faculties*, and the only source in *Afflictions*.

Again, since the *Efficient* is so called, in order to the *Effect*; seeing by *Epigenesis* some parts are after other in order, and divers also spring from those

those that are before them : it is therefore probable, that as the *Effects*, so the *Efficients* are also diverse ; which produce diverse works, from which also diverse *mutations* do proceed. So *Physitians*, in the *Physiological* part of *Physick*, do constitute some *Instruments of Chylification*, some of *Sanguification*, and some of *Generation* : and some *Anatomists*, an *Ossifical*, *Carnifical*, and a *Nervifical* faculty ; which they depute to make the *Bones*, the *Flesh*, and the *Nerves*.

But in the *Generation* of the *Chicken*, the *efficient causes* must needs differ, by reason of the several *actions* relating to it, which differ very much ; which, though they may seem *Efficientes per accidens*, contingent *Efficients of Generation*, yet are they necessarily required, since nothing could be done without their associat ayd. For while they remove external *Impediments*, or do cherish, or awaken the *conception*, and *de potentiâ in actum deducunt*, raise it from *possibility* into *actual being*, they are justly stiled *efficients*. And in this *Rowle*, the *Incubation* of the *Hen*, the temper and warmth of the *Place*, and *Air*, the *Spring-time*, and the approach of the *Sun* by the *Zodiack*, may be well listed : as also the *preparing causes*, which cause the *Yolk* to ascend, the *Macula* to be dilated, and the *resolution*, or melting of the *humours* in the *Egge*, may be numbered amongst *efficients*.

And then the *Generative* and *Architectonical* faculties, which *Fabricius* calls *parts*, are to be numbred with the *efficient causes* ; as, the *Immutatrix*, *Concoëtrix*, *Formatrix*, & *Autrix*, the *Altering*, *Concocting*, *Forming*, and *Augmenting* faculty ; as also those causes that are *efficients* in the *Accidents* relating to the *Chicken*, as that, by which the *Chicken* is either a *Cock*  
or

or a *Henne*, resembling the *He* or *Shee-parent*: and that in relation to the form of the *Cock* which was concerned in the former, or latter *cotion*: whence it comes to pass that the *Chicken* is an *animal*, and that an entire one, and not dismembered, sturdy, and sound, not diseased, and *crasie*, but a long liver; and retaining the *Species*, or degenerating from it; or proves a *Monster*, or of a mixt race.

Lastly, since in treating of the *efficient cause* of the *fœtus*, we discover the notable *structure* of it, and the *actions*, *functions*, *uses*, and *benefits* of all the *parts* and *members*, and with what *prudence*, *skill*, and *judgment*, by how *divine* an *inspiration* all things are managed, and artificially composed for the advantage of *Life*: we must not only amuse our selves in inquiring, which is the *Efficient*, *Architect*, and *Projector*, but also adore, and admire the *Omnipotent Author* and *Preserver* of so great a *Fabrick* (as justly merits the title of a *Microcosme*.) We also enquire, when, and whence it proceedeth; and where this *divine Vicar*, and *Vice-Roy* of the *deity*, which is analogous to the substance of *Stars*, and neer allyed to *Art*, and *Intellect*, takes up its residence, and keeps its *Court*.

It is apparent therefore by what hath been said, that it is a difficult thing to enumerate all the *efficient causes* of the *Pullus*: and we must needs referre the fuller disquisition of the thing to a general consideration; nor is it possible to treat fully and profitably of those things which agree to all in general, out of the single generation of the *Chicken* (without a clearer light borrowed by experience from other *Animals*.) And that the rather, because *Aristotle* himself hath recounted so many various *efficient principles* of *Animals*: For some-  
times



## Ex. XLVI. of the Chicken and Foetus. 235

times he ordaines (a) the Male the chief efficient (a) *Meta-cause*, as in whom the Ratio pulli, the Reason or *phys. 1.2.*  
 ground of the Made Chicken consists: according *¶ 4.1.*  
 to that, (b) all things are made by the same Univocal. (b) *Meta.*  
 Sometimes, (c) the Males seed: or (d) the Nature *7.10.*  
 of the Male ejecting seed. Sometimes, (e) that which *(c) De*  
 is in the seed, causing seed to be fruitfull; namely, the *par. an. 1.1.* (d) *De*  
 Spirit, and the nature in that Spirit, answerable in *gen. 1.1.*  
 proportion to the substance of the Starres. Else where, *20.*  
 (f) heat, (g) moderate heat, (h) a certain proporti- *(e) Ibid.*  
 onable degree of heat, (i) the heat in the Blood; and *1.2.c.3.* (f) *1.5.c.3*  
 in some places, the heat of the Ambient Aire. Like- *(g) 1.4.c.2*  
 wise (k) the Winds, the Sun, the Heavens, Jupi- *(h) 1.4.c.*  
 ter, the Soul, and in general, Nature, which is the *4.* (i) *De*  
 Principle of Motion and Rest. And so by the same *par. an. 2.2.* (k) *De*  
 rule, Any of the Stoicks, who thought the Soul to *(k) De*  
 be fire, may decree fire the efficient cause of Ani- *gen. an. 4.*  
 mals; because fire doth nourish and augment it *2.*  
 self, and seems in some sort to live at its own dis- *De gen. &*  
 pose and liberty: though not our destructive cu- *corrup. 1.2.*  
 linary fire, but the Natural, Celestial, Vegetative, *c.30.* *De gen. an.*  
 Generating, and Healthy fire, which the Heathen *1.2.c.c.*  
 worshipped by the name of Jupiter, whom they  
 called the Father of Men and Things; not his lame  
 Brother Vulcan, (whose ayd and benefit we not-  
 withstanding daily use in several employments to  
 our great advantage) but the divine, Animal Spi-  
 rit, the Author of Living creatures.

And therefore Aristotle saith, That this question  
 concerning the Efficient is very dubious; namely,  
 Whether it be an extrinsecal thing, or something insert-  
 ed in the Geniture or Seed: and Whether it be a part  
 of the soul, or the soul, or something which hath a soul.

Wherefore that we may deliver and rid our  
 selves of the maze and labyrinth of the manifold  
 Efficient causes, in this disquisition of the Efficient  
 of

236 *How the efficient cause of the Chick. Ex. XLVII.*

of the *Chicken*, we have need of *Ariadnes Clew*, woven and cunningly wrought of the *Observations* of almost all *Creatures* living. And therefore it is to be deferred to a more general *Inquest*. In the mean time, we shall recount those things, which relating to the particular *generation* of the *Chicken* out of the *egge*, do manifestly appear, or are strangers to the common *perswasion*, or else do require any further search.

*How the Efficient cause of the Chicken  
doth operate, according to  
Aristotle.*

EXERCIT. XLVII.

**A**Ll men generally confesse the *Male* to be the *primary efficient cause* in *Generation*; as in whom the *Species* or *Form* resides: And they farther affirm, that his *Geniture* being emitted in *coition* doth cause both the being, and fertility of the *Egge*. But how the *seed* of the *Cock* doth produce the *chicken* out of the *Egge*, neither the *Antient* nor *Modern Philosophers* and *Physitians* have sufficiently explained, nor yet solved the question proposed by *Aristotle*. Nay *Aristotle* himself hath not done it. He saith, *The Male doth not conduce to the Quantity, but the Quality; and is Principium Motûs, the Principle of Mutation; but the Female contributes the matter.* And a while after: *Every Male doth not emit seed, nor is it any part of the Fœtus, in those that do emit it: As nothing which passeth from the Car-*  
penter

*De gen. an  
l. i. c. 20.*

Ex. XLVII. doth operate, according to Arist. 237

pen-ter contributes to the matter of the Wood; nor is there any part of the Carpenters art in that which is made, but the form and species doth exist in the matter per motum ab illo, by the motion or mutation which proceeds from him. Now the soule in which the form and knowledge is, moves the hands, or other members, by the motion of a certain quality; which motion is either diverse, in such as make a diverse thing, or the same in such as make the same. But the hands and instruments move the matter. So the Nature of the Male which emitteth seed, employes that seed, as an Instrument, and having motion actually in it, as in the productions of Art the Instruments are moved; for in them, in some sort, the motion of Art is implanted.

By which words he seems to imply, that Generation is made by the motion of a certain Quality. As in Art, though the first cause (namely *ratio operis*, the reason or ground of the work) be in the soul of the Artist; yet afterward the work is effected by the motion of the hands, or other Instruments; and though the first cause be removed (as in *automaticis*, things that seem to move of themselves) yet is it in some sort said to move that, which at present it doth not touch, but hath touched formerly, so long as the motion goes on in the Instruments.

And in the following Book he hath these words: *The seed of the Male when now it hath access into the womb of the Female, it doth coagulate, and cause a consistence in the purest part of the excrement (meaning the menstruous blood residing in the womb) and doth transmute the matter which lies ready in the womb by such a motion or mutation, that at last, though the seed vanish after the motion is performed, some part of the foetus is existent, and that an ani-*  
mate

Lib. 2. c. 4.



mate part (as the heart) which now doth augment and dispose it self, as a Son who is free from his Father, and hath taken a house of his own. It is necessary therefore that there be some principle by which afterwards the order of the members may be delineated, and all things disposed, which pertain to the absolution and complement of the Animal; and from which growth and motion may arrive to the rest of the parts, and be the author of all the similar and dissimilar parts, and of their last aliment. For that which is now an Animal, doth increase; but the last aliment of the Animal is blood, or something proportionable to blood, whose vessels and receptacles are the Veines. Now the principle or original of the veines is the Heart. But the Veines like Roots extend even to the womb, by which the Foetus draweth his aliment. The Heart also being the beginning of the whole nature, and also the containing End, ought to be made first, as being a genital part of its own nature; which must needs be the first, as the original of the rest, and of the whole Animal, and of Sense: in whose heat (because all the parts are in the matter potentially) since the principle of motion did abide, that which follows afterwards, is stirred up by it, as in those self-moving miracles; and the parts are moved, not shifting their places, but altering in softness, hardness, heat, and other distinctions of similar parts, being now actually made, which were potentially before.

This is *Aristotles* opinion almost word for word, by which he conceives the fetus to be made of seed by motion; though it do not at present continue touching it, but hath touched it formerly: a nice opinion, and of a fine thread; and according to those things which are discovered in the order of the generation of the parts, not improbable. For the heart, together with the ramifications  
of

of the *Veins*, is discerned first; as being an *animate principle*, in which both *sense* and *motion* reside; and being also like a *free Son*, and a *Genital part*, by which the order of the member is delineated, and all things conducing to the accomplishment of an *Animal*, are disposed, and having all those attributes which *Aristotle* bestowes upon it.

But it seems impossible that the *heart* should be made in the *egge* by the *males seed*; since that *seed* is neither in the *egge*, nor doth touch, nor ever did touch it: because it neither enters the *womb* (where the *egge* is made) as *Fabricius* confesseth, nor is any way attracted by it; and besides this, the *mothers blood* is not in the *egge* neither, nor any other *prepared matter*, out of which the *males seed* might form this first *genital part*, the author of all the rest. Nor yet presently upon *coition* (while the *seed* as yet remains within, and is tangent) doth any particle of the *chicken* exist, but many dayes after, upon *Incubation*. And it is likewise improbable too, that in *fishes*, where the *males geniture* only toucheth the *egge* on the outside, but doth not enter into it, that the *geniture* should have any more operation and power upon it, (since it is merely an *external Agent*) then the *Cocks seed* hath upon the *Hennes egges* which are now perfectly formed.

Again, since presently after *coition* there is no track of the *egge* extant, but that it is afterwards generated by the *Henne* by her self, and that *proliffical* too, when now the *Cocks seed* is clean gone and vanished; it is unlikely that the *fatus* should be made by that *seed* in that *egge*, by one single motion, or by successive motions.

Nor do *proliffical* eggs differ from *improliffical*, and *subventaneous* in this, that the former contain the *Cocks*

240 *How the efficient cause of the Chic. Ex. XLVII.*

De gen. an.  
l. 1 c. 18.

Cocks seed (as *Aldrovandus* would have it ;) nor is there found any thing done or *coagulated*. in the *egge* by the seed of the male, or any sensible alteration made, (for there is no sensible difference at all between a *prolifical*, and an *addle egge*) and yet a *prolifical*, which is conceived a long time after coition, contains in it the power of both *Sexes*, and the capacity of being made, and of making a *chicken*: as if it had deduced its original from the coition of both *Sexes*, and their consent and conspiring together in one, as *Aristotle* would have it ; who being pressed by that argument, (as we have declared before concerning the generation of the *egge*) did constitute a soul in the *egge* ; which if it be there, must without scruple be the principle and efficient, of all those things which are naturally met with in the *egge*. For it is most certaine, What thing soever at last it prove which doth procreate the *chicken* out of the *egge*, (in whose fabrick so much skill, so divine contrivance and providence is required ; fitting eyes for sight, the bill for reception of the meat, the feet for walking, the wings for flight, and all the other Utensils for some employment or other) that it is either a soul, or else something more worthy and excellent then a soul, working by wisdom and providence.

And by the generation of the *chicken* it is also manifest, that whatsoever be the *principium vite*, the first cause of life, and vegetation, was first of all in the heart. Wherefore, if it be the soul of the *Chicken*, it is plain that it also was in the *Punctum saliens*, and in the *Blood* ; because we discover motion & sense there : for it moves and dances like an *Animal* ; so that if the soule do exist in the *Punctum saliens*, building, nourishing, and enlarging the rest of the body, (as we have shewed in our History) then



Ex. XLVII. doth operate, according to Arist. 241

Then it flowes from the Heart as from the Spring-head into the whole body.

Likewise if the Egge be therefore *Prolifical* because it hath a soul, or (as *Aristotle* would have it) a part of the *Vegetative soul*; it is plaine, that the *Punctum saliens*, and the *Genital animate part*, doe proceed from the *Soul* of the egge; (for nothing is the Author of it self) and that the soul is derived from the egge into the *Punctum saliens*, by and by into the *Heart*, and at length into the *Chicken*. de gen. an. l. 2. c. 4.

Adde to these, if the egge have a *prolifical vertue*, and *Vegetative soul*, by which it erects a *Pullus*; and so owe them (as it is plain it doth, and all men confess it) to the seed of the *Cock*; it is then certain that this *Seed* is *Animate*: For so *Aristotle*: *Whether the seed have a soul or no; there is the same reason to be given for it as for the Parts.* Ibid. l. 2. c. 1. For no soul can be in any thing but in that whose soul it is; nor can there be any part which is not partaker of the soul: unless it be an equivocal part, as the eye of a dead man. That therefore the seed hath a soul, and a being in potentia, is clear.

It therefore follows out of what hath been said, that the *Male* is the *Primary Efficient*, in which *Ratio*, & *forma*, the Reason and Form is; which *Efficient* begets a *prolifical seed*, or *Geniture* rather, and that *Geniture* endowed with a *Vegetative soul*, (with which also its other parts are endowed) he doth transmit into the female. This *Geniture* being transmitted, it moveth the *Matter* in the *Hen*, that so an *Animate* egge may be produced; by which means the first particle of the *Chicken* is animated, and afterwards the whole *Chicken*. So that according to *Aristotle*, either the same soul is conveyed by a *Metempsychosis*, from the *Cock* into

his Geniture, from his Geniture into the substance of the Hen, from thence into the egge, and from the egge into the Chicken; or else is raised up in the subsequent by the precedent things, namely by the Male, in his proper seed; by the seed, in the egg: and at last by the egge, in the Chicken, *tanquam lumen de lumine*, as light derived from light.

The Efficient therefore which is sought for in the egge, from whence the Chicken is born, is a soul; and the soul of the Egge: for according to Aristotle, the soul is onely in that thing, whose soule it is.

*Ibid.* But it is manifest that the Seed of the Male is not the Efficient of the Chicken, neither an Instrument, by whose motion the Chicken might be formed, (as Aristotle would have it) nor as an Animate substance, as if the soul were its soul. For in the egge there is no seed at all, either now touching it, or that ever did touch it, (and it is impossible that that should move, which doth not touch; or that any thing should be affected by that, which doth not move it) and therefore the seeds soul ought not to be said to be in it. And yet though the soul be the Efficient in the Egge, yet it doth not appear to be derived rather from the Cock, or his seed, then from the Hen.

Nor is it transferred by a *Metempsychosis*, or certain translation of the soul from the Cock and his seed, into the egge, and thence into the Chicken? For how can it be translated into the Egges that are yet to come, and to be conceived after *Covition*? Unless some Animate Seed do lurke in the Hen all the while; or else the soul onely without seed be translated, that so it may be afterwards infused into the Egge when the Egg shall be made. But neither of these is true. For the seed is



no where found in the *Hen*: nor is it possible that the *Hen* should after Coition possess two souls; namely, her own, and the soul of the future eggs, and Chickens: For the soul is never said to be, but in that whose soul it is: much lesse can one, or more souls lye lurking in the *Hen*, that so they may attend the future eggs and chickens which are to be born in their order.

We have deduced these passages out of *Aristotle*, that from them it might appear, how the *Cock* seed doth, according to him, produce the *Chicken* out of the *Egge*, that so some light might be afforded to this perplext disquisition. But seeing they do not explaine how this business is accomplished, nor yet salve his own objections; we are still sticking in the same mire, and involved in the same doubts, (concerning the Efficient cause of the *Fetus*, in the Generation of Animals) nay so far are we from receiving any clear satisfaction, that we are rather more perplext, and to seek, then we were before. And therefore no wonder this excellent Philosopher was in the streights concerning this matter, and did therefore range together so many several sorts of efficient causes of Animals, and sometimes betake himself to examples drawn from *Automata*, things seeming to move of themselves, sometimes to coagulated matter, sometimes to Art, Instruments, and Motion; sometimes to the soul in the egge, and in the seed of the Male, (to illustrate the thing) and where he seems to be positive and settle upon some determination, concerning what it may be, that should render the *Seed*, (be it of Plants, or Animals) fertile; he renounces Heat and Fire, as improper Agents; nor doth he admit any such like faculty; nor can he find out any thing in the seed



it self, which should be fit for the undertaking ; but is compelled to admit of a certain Incorporeal extrinfecal thing, which should (like Art, or the Minde) form the *fetus* by wisdom and providence, and ordain and institute all things relating to it , to some end and purpose, and to its better subsistence. He takes, I say, sanctuary, in an obscure and ignote thing ; namely ; in a spirit contained in the seed and frothy substance, and a certain nature in that spirit answerable in proportion to the substance of the Stars. But what that should be, he no where reveals.

*Fabricius his Opinion concerning the  
Efficient cause of the Chicken  
is confuted.*

EXERCIT. XLVIII.

SINCE I have proposed *Aristotle*, the chiefest of the Old Philosophers, and *Hieronymus Fabricius ab Aquapendente*, an eminent Anatomist amongst the Modern, to be my Leaders, that from them I might chiefly be enlightened concerning the generation of Animals, and since I cannot better my self by *Aristotle*, I have resolved to set upon *Fabricius*, to see what account he can give of it.

Now he attempts to give resolution to three doubts arising in the case : namely, First, What is the Efficient of the *Chicken* ? and that he concludes to be the Males seed. 2. How this appears in the egg to be so, and by what means the Cocks seed doth render

EX. XLVIII. *the Efficient cause of the Chicken.* 245

render the egge fertile? Lastly, In what Order are the parts of the *Chicken* procreated?

As for the first, it appears out of our *Observations*, that the *Cock* and his seed are indeed the *Efficient cause* of *Generation*, but not the *adequate cause*; but that the *Henne* also comes in for a share.

In this place therefore we must chiefly enquire, how the *Cocks* seed doth fructifie the *Egge*, and raise a *Chicken* out of it, which would else be *subventaneous*, and *improlifical*.

But let us give ear to *Fabricius*: *Those creatures*, pag. 38. saith he, that are produced out of an egge, are different from those which are born out of seed; in this, that *Oviparous* creatures have a matter, out of which the *Chicken* is corporated, distinct and separate from the *Agent*: but *Viviparous* creatures have both the material and efficient cause adjoyned, and concorporated together. For the *Agent* in *Oviparous* creatures, is the seed of the *Cock* in the feathered kind, which neither is, nor can be in the *Egge*: but the matter out of which the *Chicken* is corporated, is the *Chalaza*. These two are much distant one from another; for the *Chalaza* is in the *Yolk* now formed, and fallen into the second *Uterus*, and is adjoyned intimately to the egge: on the contrary, the *Cocks* seed remains neer the fundament, and is removed from the *Chalaza* by a large chasme, and yet by its irradiating faculty it fructifies both the *Uterus*, and all the egge. But in a *Viviparous* animal, the seed is both the *Matter*, and the *Efficient* too, both being contracted into one body.

He seems to have introduced this difference between *Oviparous* and *Viviparous Animals*; that so he might countenance the opinion of *Physicians* concerning the *Generation of Man*, or at least not subvert it; who conceive that the seeds of both

*Sexes*, ejected together in *coition* are mingled, and according as the one prevails over the other, so the one approves it self the *Efficient*, and the other submits it self to become the *Matter*; so that they both conspiring together, do constitute the conception in *Viviparous Animals*.

But when he had observed, that neither *Seed* nor *Blood* is attracted by means of *coition* into the *womb* of the *Hen*, nor contained there, and could not believe, that any thing emitted from the *cock* in *coition*, could possibly arrive so farre, nor could finde any thing in the *EGGE*, that is adjoined to the *males seed*, he was enforced to doubt, how the *seed* (which is no where present with, nor mingled amongst the *feminine geniture*, nor is adjoined to it, nor doth so much as touch it at all) should constitute the *Chicken*, or fructifie the *EGGE*? especially when he had before delivered, that from some premised *coitions*, all the *eggs* that were to be layed that year, were made *prolificall*. For how could it chuse but seem impossible, that from the *seed* of the *cock* received in the *Spring* (but now departed, lost, and consumed) the *posthume eggs* (layed possibly in *Summer* or *Autumne*) should be rendered *fruitfull*, and produce *chickens*?

That he might rid his hands of this grand difficultie, he coined the fore-said distinction; and to ratifie his opinion, he adds three farther Assertions: First, that though the *cocks seed* were neither in the *EGGE*, nor at any time in the *Womb*, nor adjoined to the *material cause*, (as it is in *Viviparous Animals*) yet it continues for a whole year in the *hen*. Secondly, to reserve this *seed* in, he invents a dark perforation, neer the door of the *Womb*, wherein the *cock* should deposite his *seed*, and in which (as in a *pouch*) it should be concluded:



Ex. XLVIII. *the efficient cause of the Chicken.* 247

ded ; that thence all the eggs might receive their fertility. Lastly, though the seed in that pouch, neither touch the womb, the egge, nor the Ovary, that by that means it might fructifie the egge, or raise a Chicken out of it ; yet, he saith, that it gains addresses into the very egge, by the insinuation, or irradiation of a certain spiritual substance in it, and by those arts doth fructifie the Chalazæ, and so model a Chicken. And yet by that assertion he seems to confirme Aristotles opinion (who assures us that the female contributes the matter, and the male the efficiency to generation) which is contrary to the Physitians position concerning the commixture of seeds : for whose sake he seems to have introduced his fore-said distinction between Oviparous, and Viviparous Animals. And that this his opinion may seem more probable, he recites what changes and alterations the seed reserved in the Testicles and seminary Vesicles, not yet emitted, doth procure in Animals.

But to take no notice that all this makes little to his purpose : (for the question in chief is not, How the Cocks seed doth render the egge fertile ? but rather, How it doth frame and erect a Chicken out of the Egge ?) all those things which he hath conjured up to guard his opinion, seem for the most part false, or very suspicious ; as appears by our Observations delivered in this History. For neither is that blinde perforation in the root of the rump (which he calls the purse, or pouch) destined to cubbard up the Cocks seed, nor is there (as we have said) any seed at all found in it : but it is an empty unprovided thing both in the Cock, and Henne.

But what he would have by his spiritual substance, and irradiation, he is yet to acquaint us, as

also what substance hee understands that to be, which he affirms, doth by its virtue vivifie the *egge*. Whether a *corporeal*, or *formal* substance, which should proceed from the irradiation of the *seed*, (which lies at roost in the *pouch*) and (which is chiefly required) should fashion the *Chicken* out of the *egge*.

To conclude, in my minde, he saith no more in substance then this : *It makes the Chicken, because it irradiates the Egge ; and forms it, because it vivifies it :* and so he labours to reveal and illustrate the obscure manner of formation, by one more obscure then it self. For the same scruple returns entire ; namely, how the *Cocks seed*, a meer *non-tangent*, an *external efficient*, and disjoyned by place, remaining in the *pouch*, can fashion the interior parts (that is, the *Heart*, *Liver*, *Lungs*, and *Guts*, &c.) in the *egge* out of the *Chalaza*, by *Irradiation* ? Unless he will have it sitting in its chair of State, like the Creator of all, only by this word of command, *Fiant*, Let all things be so ; (namely the *Bones* for *Support*, the *Muscles* for *Motion*, the *Organs* for *Sense* ; the *Members* for *Addition*, the *Intrals* for *Concoction*, and the like) and so order, and by its beams or influence constitute all things to their proper end, with providence, wisdom, and art. For neither doth *Fabricius* expound the manner, nor yet demonstrate the *seed* to be of such force and virtue, that (without coming neer) it can effect all this ; especially since an *egge* can, by *Incubation* of a stranger fowle, or any other fostering warmth ; as in *dung*, in a *mat*, or an *oven*, though never so remote from the *pouch* of its own *mother-ben*, be quickened, and produce a *fetus*.

The same difficulty therefore lyes still upon our hands ; namely, How the *Cocks seed* is the *Efficient cause*

Ex. XL  
cause of  
the infl  
though  
in the  
diation  
laza :  
namely  
led. B  
us.  
When  
cause of  
Egge, an  
one, wh  
distant  
an othe  
be hatch  
or dung  
would st  
and very  
ral power  
terene ki  
cies, and  
Wheref  
neither  
namely  
produce  
med the  
since it  
to the E  
clude, th  
cause of  
ently dec  
our Hen

Ex. XLVIII. *the Efficient cause of the Chicken.* 249

*cause of the Chicken?* nor is it any whit salved by the influence of this spiritual substance. For though we should grant, that the *seed* is reserved in the *purse*, and that by a *Metamorphosis*, and *Irradiation*, it did incorporate the *chicken* out of the *Chalazæ*: yet the scruple would stick no less by us; namely, How the *Intrals* of the *Chicken* are modelled. But these things are long since confuted by us.

Wherefore, when we are in quest of the *efficient cause* of the *Chicken*, we must look for it in the *EGGE*, and not dormant in a *pouch*; and for such a one, which, though the *egg* now grown stale, were distant many miles from the *Hen*, and laid under an other *Hen* (as a *Turkey-hen*, or *African-hen*) to be hatched; or (as in *Ægypt*) under warm *sand*, or *dung*, or in an *Oven* proper for the purpose, would still raise up a *chicken*, of the same *species*, and very like the *Cock* and *Hen* that were its *natural parents*; or else (in case the *Cock* were of a different kinde) a mungrel off-spring, of a mixt *species*, and resemblance.

Wherefore the knot remains to be untied, which neither *Aristotle* nor *Fabricius* have loosened; namely, How the seed of the *Male*, or *Cock*, doth produce the *chicken* out of the *egge*, or is to be named the *Efficient cause* of the *chicken*, especially, since it is neither present, tangent, nor adjoined to the *EGGE*? And though almost all men conclude, that the *Male*, and its *seed* are the *Efficient cause* of the *Fætus*; no man yet hath sufficiently declared, how it can be done, especially in our *Hen-egg*.

The



*The Efficient cause of the Chicken,  
is hard to be found out.*

## EXER. XLIX.

**T**he disquisition of the *Efficient* is exceeding difficult; (as we have said) and that the rather, because so many names are attributed to it. Whereupon *Aristotle* doth recount very many *efficient causes* of *Animals*: And many controversies are risen amongst authors; chiefly, between *Physicians* and *Aristotelians*, who contend very earnestly about it; endeavouring by different opinions to explain both the *Efficient cause*, and the manner of its *Efficiency*.

And indeed the *Omnipotent Creator*, doth in none of his works more manifestly reveale the presence of his Deity, then in the Fabrick and Structure of *Animals*. And though it be a known thing, subscribed by all, that the *fetus* assumes its original and birth from the Male and Female, and consequently that the Egge is produced by the Cock and Henne, and the Chicken out of the Egge: yet neither the Schools of *Physitians*, nor *Aristotles* discerning Brain, have disclosed the manner, how the Cock and its seed, doth mint and coine the Chicken out of the Egge. For it is evident enough, by what we have delivered, concerning the Generation of *Oviparous Animals*, and others, that neither the Opinion of *Physitians*, deducing Generation from the mixture of the Seeds of both Sexes, nor *Aristotles* neither, establishing the seed of the Male for the *Efficient*, and the Menstruous Blood for the *material Cause*, are to be embraced: because

because that neither in *Coition*, nor presently upon *Coition*, any thing doth part from the Female into the *Cavity* of the *Uterus*; out of which, as out of the *Matter*, any thing relating to the *Fetus* should be suddenly produced: nor doth the *Geniture* of the Male (whether it be animate it self, or an animate Instrument) enter into the *Womb*, or is attracted thither, or any where else reserved in the Female, but doth either vanish, or retract: nor is there any thing else to be found in the *Uterus* presently after *Coition*, which issuing either from the Male or Female, may be fancied to be the *Matter* or *Original* of the future *Fetus*. Nor is the Cocks seed surviving in *Fabricius* his Pouch, or any where else in the Henne; that thence, either by the *irradiation* and influence of *spiritual* substance, or by *contact* the *egge* is made, or a *Chicken* out of the *Egge*. Nor doth the *Hen* contribute any other *seed*, then the *Papula*, the *Yolk*, and the *Egge*. And therefore the contemplation is rendered more intricate by our *Observations*; because by them all those suppositions, upon which both the other opinions were supported, are thrown down to the ground. But especially, when we shall anon demonstrate, that all *Animals* are alike generated out of an *Egge*; and that in *Coition* (whether of *Viviparous*, *Brutes*, or *Men*) no *Seed* or *Blood*, proceeding from either *Male* or *Female*, is entertained in the *Hollow* of the *Womb*, or drawn up thither before *Coition*, or in *Coition*; or after *Coition* is found in the *Womb*, which may be conceived to be the *Matter Efficient*, or *Principle* of the future *Fetus*.

*Daniel Sennertus*, a late learned Man; and a careful Inquirer into *Nature*, having first ballanced other mens opinions, attempts at last to resolve the

the business; concluding that the *Soul* is in the *Seed*, and that it is the very same *Soul* with that, which afterwards informs the *Infant*: so that he makes no scruple to affirm that the *Rational soul* of *man*, is present in his *Seed*: and that therefore the *Egge* possesses the *Soul* of the *Chicken*: and that the soul is conveyed with the *Seed* into the *Womb* of the *Female*: and from that seed of both *Sexes* conjoynd (as one flame to another) but not mixed (for mixture, saith he, respects things of diverse *Species*) but indowed with a *soul*, a perfect *Animal* doth result. And therefore, saith he, the *Seed* of both *Sexes* is required, both to the constitution of an *Infant*, and of an *egge*. And thus, (like one that had subdued all difficulties) He conceives, he hath delivered a certain and perspicuous Truth.

But, granting that there is a *Soul* in the *egge*, and that *soul* united and made up of the *souls* of the *Parents*, and sometimes proceeding from *Parents* of of several kinds, as from a *Mare* and an *Ass*, from a *Dunghil-Hen* and a *Cock-Pheasant*; and that it is not *Mixed*, but *United*; and that the *Chicken* (after the manner of the *Seed* of *Vegetables*) is made by that efficient *soul*, being afterwards preserved by it, all its life long: so that it be counted absurd to affirm, that the *fetus* is cherished by one soul out of the *Uterus*, or *egge*; and by another in the *Uterus* or *egge*: suppose, I say, we grant all this (though it be invalid, and doubtful) yet our *History* of the *Generation* out of the *Egge*, doth utterly subvert, and confute as false the very foundation and basis upon which all his doctrine leans, and relies: Which is this, That the *egge* is constituted of the *Seed* of *Cock* and *Hen*: or, that the seed is transmitted from both into the *Uterus*: or that



that the *fetus*, or any part of it is formed of the seed so entertained by the *womb*, or cast into it : or, that the seed of the *Cock* (as an *Efficient cause*, or *Operatour*) is any where reserved in the *Hen*, which (as he conceives) draws matter and nutriment from her into the *Womb*, to support the *fetus* which it hath made. For the conditions which he himself according to *Aristotle* reputes necessary, will be found wanting : namely, that the *fetus* ought to be made of that which actually is in being, and doth pre-exist : and that the *Chicken* is nourished by that which is present with it, and in the same place where it self is first constituted : As also, that it should be made by that which doth operate being immediately conjoynd to it ; and ought to be the same thing, by which the *chicken* is preserved, and augmented all its life-time. For the *cocks seed* (whether *Animate*, or *Inanimate*, it matters nothing) is not at all in the *Egge*, nor in the *Uterus*, present, and conjoynd ; nor in the matter whence the *chicken* is framed, as neither in the *Chicken* it self now begun, that so it may either frame, or perfect it.

He miscarries likewise, when he goes about to illustrate his opinion concerning the *Animal seed*, by allusion to that of *Plants*, and *Mast* : because he did not understand the difference alledged by *Aristotle*, between the *Geniture* proceeding by *coition*, and the first conception made out of both *Sexes* ; nor did observe that an *egge* might be first conceived in the *Cluster* of the *Vitellary* (without the translation of any *Geniture* from Male and Female into the *Uterus*.) Nor did he apprehend that the *Uterus*, even for some time after *Coition*, is quite void of any matter at all, either transmitted from the *Parents*, or made by *Coition*, or occasioned

casioned any other way. Nor had he read, or at least observed *Fabricius* his experiment; namely, that after some *Coitions* of the *Cock*; the *Hen* may be so fructified, that from that time for the whole succeeding year she may lay all Prolifical Eggs: though she have not in the interim conversed with the *cock*, whereby each particular *egge* might receive fecundity; nor yet retained so long the seed she formerly received.

This is agreed upon by universal consent; that all *Animals* whatsoever, which arise from Male and Female, are generated by the coition of both Sexes; and so begotten as it were *per contagium aliquod*, by a kind of contagion. In like manner as *Physicians* observe, that contagious diseases (as the *Leprosie*, the *Pox*, the *Plague*, and *Pibisick*) do propagate their infection, and beget themselves in bodies yet sound and untoucht, meerly by an extrinsecal contact; nay sometimes onely by the breath, and *per insensum*, by iniquination; and that at a distance, through an inanimate medium, and that medium no way sensibly altered. So that, that which had the first touch, begets an *Univocal* like it self, not as touching at this instant, nor yet now actually in being, nor as present, or conjoined, but meerly because it once hath touched. Of so great operation and energy is *Contagion*. And perhaps the same thing obtains in the Generation of *Animals*. For *Fishes* *egges*, which acquire their growth abroad at their own dispose, without any Male-seed, (and therefore do without all doubt live without it) being besprinkled with the Males prolifical milky substance, and onely tingured from without, do generate fishes. Tis not, I say, an intromission, or intimate reception of the masculine seed into each particular *egge*, which



which sets it a work about the fabrick of bodies, or introduces the soul, but a bare contact. Whereupon Aristotle calls *lac maris*, the Males milk, or genital seed cast into water, sometimes *genital*, and propagating liquor: and sometimes *Vital Venom*. For saith he, The Masculine fish sprinkles the egges with genital seed, and those egges which that *Vital Virus*, *Vital* or quickning *Venom* touches, out of them are born fishes. It being therefore laid down as an undoubted principle, that the fetus is made by *Contagion*, there will a weighty doubt arise; namely, how bare *Contagion* can be the author of so great a work? and how the parents can by that generate issues like themselves; or the males seed produce an *Univocal* like that creature from which it proceeded? since after contact it bids adieu, and is no longer in being, or touching, or present at all, but clean corrupted, and a *Non-ens*. How, say I, can a *Non-ens* act? or a *Non-tangens* erect a fabrick like it self? or that which is dead it self, impart a life to another thing, and meerly upon this account, that the time was when it did touch.

For Aristotles argumentation seems false, or lame at least, where he contends: *That Generation cannot be without an Agent and a Patient: and those things cannot act and suffer, which do not mutually touch each other: but those things do mutually touch, which having each their particular magnitude and place apart, have their extremities meeting one another.* de gen. an. l. 1. c. 6.

But since the case is plain, that *Contagion* (where the things touch not, nor have their extremities kissing one another) can destroy living creatures, what should hinder, but that it should be as powerful, to conduce to the life and generation of animals.



*mals.* ? The Efficient in an Egge, by a *plasticall vertue* (because the male did but onely touch, though he now be far from touching, and have no extremity reached out towards it) doth frame and set up a *fetus* in its own species and resemblance. And this author of fecundity, this peir-  
cing power is translated through so many *mediums* or *instruments*, that one cannot pattern it, neither by that mutation procured by instruments (as in the productions of Art) nor by *Aristotles Automata*, nor our *Clocks* or *Watches*; nor by the instance of a *King* in his own dominions, where his command is every where a law; nor can you ratifie this our doctrine, by introducing a soul into the seed or geniture.

And hereupon many controversies, and problemes are started concerning the attractive power of the *Load-stone* and *Jet*: concerning *Sympathy*, and *Antipathy*, concerning *Poyson*, and the contagion of *pestilential diseases*: concerning *Alexipharmacal Medicines*, and such as *cure* or *kill* from an *occult* (or rather *ignote*) *quality* and *propriety*: all which seem to execute their pleasures without any touching. And chiefly this. What is there in generation, that by a momentany touch (nay not touching at all, unlesse through the sides of many *mediums*) can orderly constitute the parts of the *Chicken* by an *Epigenesis*, and produce an *Univocal creature*, and its own like? and for no other reason, but because it touched heretofore. How, I say, can that which is not present, and did onely touch outwardly, constitute, orderly dispose and linne all the members of the *Chicken*, in an egg which is now exposed to the wide world, and oftentimes transported a great way off. For nothing can make and generate it selfe into anothers likeness.

What

*What the Efficient cause of Animals is ; and what its Conditions.*

EXERCIT. L.

**T**Hat therefore we may in some proportion dive into the knowledge of the efficient cause, (so far forth as concerns our present contemplation) we must take notice first of the *Instruments* or *Mediums* which pertain to the *efficient* or *forming cause* : and into this rank is the *Male* and *Female* for to be reduced, likewise the *Geniture*, and the egg, and its first rudiment. For some *males* (and *females* too) are *barren*, or *unfruitful*. And likewise the *males geniture* is sometimes more, and sometimes less fertile : for the *Semen Virile* as it is barely contained in the *Seminal Vesicles* (except it be rarified into froth by the spirits, and forceably leap out) is *unfruitful*. And this too, possibly is not always successful. Nor are the *Papulae*, or *Yolks* bred in the *Cluster* of the *Ovary*, or the *Egges* contained in the *Womb*, all presently fruitful.

Now I call that *fruitful*, which (except some impediment happen from without) will attaine its designed end, by the *efficient* power implanted in it, and compass that, for whose sake it is ordained. So that *Cock* is reputed *fertile*, who causes his *Hens* to lay oftner, and more constantly, and also renders their *egges* generative.

So likewise that *Hen* is *fruitful*, which is useful in laying *egges*, and hath a good retention in order to the *proliferal* vertue imparted to her from

the *Cock*. So the *Cluster* of the *Papule*, and *Ovary* it self are councied fertile, when they are well fraught with store of rudiments and foundations of egges, and those mature.

Likewise that egge is fertile, which is farthest from being subventaneous or addle, and doth less faile in producing a *Chicken*, howsoever you dispose of it, either to *Incubation*, or any other fostering-heat.

Therefore such an efficient of the *Chicken* is required, as may impart virtue to all these, by which they may be fructified, and obtain an efficient power; for the same thing, or at least something proportionable to it, is in them all, bestowing fecundity upon them. And the *Inquiry* is the same, namely, what it is in the *Egge*, that renders it fertile: what in the *Ovary*, and what in the *Papula*; likewise what in the *female*, and lastly in the *seed* and *Cock* himself, &c. What in the *Blood*, and *Punctum saliens*, or first genital particle, from whence afterwards the rise, fabrick, and order of all the other parts is derived: as also, what is it in the *Chicken* it self, from whence it grows sturdy and active, attains its youth and maturity, lives a healthy life, and a long.

Nor is that inquiry unlike this, which demands, what both *male*, and *female* (*Cock* and *Hen*) confer to the fertile egge; or what it is which proceeds from both, towards the perfection and similitude of the *chicken*; as whether the egge, conception, matter, and nutriment proceed from the *female*, and the *Operative* virtue from the *male*; whether a certain contagion sent forth by coition, or created by it, or received from it, remaining in the *Hen* or *Egges*, work upon the matter of the egge; or attract a nutriment from the *Hen*, concocting and



and distributing it, to the encrease of the *egge*, and afterwards to the production of the *chicken*: Or lastly, whether all that which relates to the *form*, *soul*, and *fecundity*, do proceed from the *male*; but from the *female*, whatever relates to the *matter*, *constitution*, *place*, and *sustenance*. For in *animals* (whose *Sexes* are distinct) it is so contrived, that because the *female* cannot alone generate, nourish, & protect the *fetus*, the *male* is joined as yoke-fellow in the task (as the Superior, and more eminent *progenitor*) to supply her failings; and so to correct the infirmity of the *Subventaneous eggs*, and inspire them with fertility.

For as a *chicken* born of an *egge*, is indebted to that *egge* for his *body*, *soul*, and *principal* or *genital part*: So is the *egge* for all it has, to the *Henne*; and the *Henne* also for her *fecundity* to the *Cock*.

But whether the *male* be the first and principal cause of the *progeny*, or whether the *male* and the *female* are intermediate and *Instrumental causes* set awork by *nature*, or the first and *Supreme Genitor*, we have here an occasion offered to enquire; and it is a very worthy and necessary one, because all perfect science depends upon the knowledge of all causes: and therefore to the plenary comprehension of *Generation*, we must ascend from the last and lowest efficient to the very first and most *supreme*, and know them all.

But as for the first and *bighest Efficient* of the *chicken*, we shall determine what that is afterwards, (when we treat of the *Efficient* of all other *Animals*) but what kind of one it is, we will here declare.

The first condition, or qualification, of the first and *primary Efficient* properly so called, is, that

it be the first & principal fructifier, from whence all intermediate causes assume their derived secundity. For instance, the chicken is derived from the *Punctum saliens* in the egg, not only in regard of its bulk, but also, and that chiefly in regard of its soul; the *Punctum saliens*, or Heart is derived from the egg, the egg from the Hens, and the Hens fertility from the Cock,

Another requisite or condition of the primary Efficient is defumed *ex opere facto*, from the production it self, viz. the Chicken: because that is the prime efficient, in which the reason of the effect doth chiefly appear. But because every Generative efficient doth generate its like, and the issue is of a mixt nature; the first efficient must needs be mixt too.

Now I therefore pronounce their issue to be of a mixt nature, because, the mixture of both parents is refulgent in it, both in the figure and lineaments of the body, and all its parts; as in complexion or colors, moles or spots, diseases, and other accidents of the body. Likewise in the soul and actions, and functions (as in like manners, docility, gate, and voice) such a kinde of temperature is discoverable. For as we say that a similar mixt body is made of the Elements, because their virtues, heat, cold, moisture, and siccity, are found compounded in the same similar body: so likewise the paternal and maternal handy-work may be tracked and pointed out both in the body, soul, and other accidents of the Chicken: (which follow the temperature, or happen unto it) for instance; In a Mule, the soul, body, manners, and voice of both parents; (viz. of the Mare, and the Ass) are apparent. So also in those Chickens which are the Offspring of the dunghill-hen, and Cock-Pheasant: and in that mungrel Carre, which is produced by the sodomie of a Wolf and a Bitch.

Since therefore the Chicken resembles both parents;

rents, and is a mixt Effect: the generant primary cause (which it resembles) must needs be mixt likewise. Therefore that which frames the *Chicken* in the *Egge* is a mixt nature (as being united, or compounded of both) and the work of both parents. And if any contagion do arise or remain in the female upon coition, (in which they two are mixt, and become as it were one *Animal*) that also will be of a mixt nature or power, by which the *egge* shall afterwards become fertile, and achieve a *plastical* virtue, which is an *Agent* of a mixt nature, or a mixt efficient-Instrument, producing a *Chicken* of a mixt nature also.

The contagion, I say; because *Aristotles* persuasion is altogether refractory to experience herself: namely, where he saith, that some part of the *Fœtus* is instantly made upon coition. Nor is that true neither, which some of the *Moderns* averre, namely, that the soul of the future chicken is in the *egge*: for that is no whit the chickens soul, which is in no part of the chickens body. Nor can the soul be said either to be begotten, or left behind presently upon coition: for otherwise there should be two souls in a *Woman* with child. Therefore till it be determined what the efficient of the *egge* is, which is of a mixt nature, and ought to remaine present upon coition: give me leave to call it contagium, Contact, or contagion.

But where the contagion lurks in the female after coition, and how it is communicated and derived to the *egge*, requires a more exact Disquisition: and we will afterwards fall upon it, when we treat generally of the conception of females. It shall suffice, in the mean time to have taken notice, that it must needs be the fate of the first efficient (in which the reason of the future off-spring doth abide



bide) that, since its off-spring is mixt, to be of a mixt nature it selfe; and either to proceed from both Parents, or from something which makes use of both ( as animate Instruments, cooperative, and mixt, and moulded into one by coition.)

The third condition of the Primary Efficient is, that either it impart motion successively to all its intermediate instruments, or else employ them otherwise, but that it selfe be subservient to none: whence a doubt arises, whether the Cock be the Primary Efficient in the Generation of the chicken, or have any before, or superior to him. For all generation seems to be derived from Heaven, and issue from the motion of the Sun, and Moon. But we will be positive in this matter, when we have first declared, what an instrument, or the instrumental efficient cause is, and how divided.

Now Instrumental Efficients are of diverse kinds; some, according to Aristotle, are *factiva*, Making, and some, *activa*, Doing; some do not operate, but when they are conjoynd with a prior efficient, as the hand, foot, and genital parts; others operate, disjoined, as the Geniture and the Egge: some Instruments have not motion or action, but what is given them by the first Efficient; others have proper internal principles of their own, to which nature affords no motion in generation, but yet employs their faculties, and sets them the rule, and law of their performances; as the Cook employes fire, and the Physitian herbs, and the vertues of medicines to cures.

Sennertus, to maintain his conceipt, concerning the soul in the Seed, and the formative faculty in the Egge, affirms, that not onely the Egge, but the Cocks seed also, is indowed with the soul of the future Chicken, and is not the Instrumental Agent, but  
the

the *principal*; absolutely denying that any separate *Efficient*, is *Instrumental*: but pronouncing, that onely that is to be reckoned an *Instrument* in propriety of speech, which is conjoined with the *primary efficient*: and that, that onely is an *Instrumental efficient*, which hath no other motion, or action, then that which is immitted, or continually and successively received from the *primary efficient*, by whose power it acts. And upon that account, he rejects the instance concerning things cast or hurled, which receiving their force from the thing that doth hurle, do yet notwithstanding move, even when they are separated from it. As if the *Sword* and *Speare* were to be counted *Instruments* of War, but not *Arrows*, and *Bullets*. Hee also rejects the instance drawn from a *Republick*, and denies that the *Magistrates*, *Counsellors*, or *Officers* of a *Common-wealth*, are the *Instruments* of a *Nation*: And yet *Aristotle* reckons a *Counsellor* for *Polit. l. i.* an *Efficient*, and calls an *Officer* an *Instrument*, in *c. 4.* plain termes. He likewise decries the instance of the *Automata*, and many other things, that so he may ratifie the seed (or egge) to be *Animals*, and not an *Instrumental*, but a *Principal Agent*. And yet (as if he were enforced by the truth) he laies down such conditions for a *Principal Agent*, as do absolutely prove contrary to his own fore-mentioned opinion. *Whatsoever produceth a work, or effect more noble then it selfe; or else an effect like to it selfe, is not an Efficient, but an Instrumental cause.* Which being granted, who will not conclude, that *Seed* and an *EGGE*, are *Instruments*? Since a *chicken* is an effect nobler then the egge, and neither like an *EGGE*, nor *Seed*. Wherefore, when this most Learned Man denies the *Seed* or *EGGE*, to be an *Instrument*, because they are separated from

the *Primary Agent*, he stands upon a false bottom. For since the first *generant* produceth its off-spring by several *mediums*, whether any of those *mediums* be conjoined to it, as the *Hand* to the *Artist*; or whether it be separated from it, as the *Arrow* shot from the *Bow*; yet both are called *Instruments*.

From these recited *conditions* of the *Instrumental cause*, it may seem to insue, that the *cock*, or at least the *cock* with the *hen*, are the *Primary efficient* in the *Generation* of the *chicken*: for the *chicken* is like them; nor can it be thought to be more noble then its *Efficients* or *Parents*. I shall therefore adde one condition more to the *Primary efficient*, by which perhaps it may appear that the *Male* is not the *Primary*, but the *Instrumental cause*; namely, that it is required of the *Primary efficient* in the *fabrick* of the *Chicken*, that he employ *Skill*, *Providence*, *Wisdom*, *Goodness*, and *Understanding*, far above the *capacity* of our *rational soules*; as that, in which the *Reason* or *Idea* of the *future work*, ought to consist, and which ought likewise to act for some *destinated end*, disposing and perfecting all parts, forming the *smallest* and *most inconsiderable appendixes* of the *Chicken* for some use, and employment: not providing onely for the *structure* of the creature, but for its *wellfare*, *ornament*, and *defence*.

Now the *male*, or his *seed*, either in, or after *coition*, is not so qualified, that *Art*, *Understanding*, and *Providence*, may be attributed to it.

Which things being pondered, the *Male* seems to be an *Instrumental efficient*, as well as his *seed*, and the *Hen* likewise as well as the *Eggs* she laies. And therefore we must take our flight to a more *Primary*, *Superior*, and more *excellent cause*; to which we may justly attribute *Providence*, *Understanding*, *Art*,



Art, and Goodness; and such a one as is as much superiour to its effects and Workmanship, as an *Architect* is better then a *Barn* he sets up; a *Prince* then his *Officers*, or an *Artist*, then his owne hands.

And therefore both *Male* and *Female* are but *Instrumental* efficients, subservient to the high *Creator*, or *Protogenitor*. And in this sense it is truly said, that the *Sun*, and *Man*, beget an *Animal*, because the *Spring* and *Autumn* do insue upon the *Approaching* and *Receding Sun*, at which times commonly, the generation and corruption of *Animals* happen. So the chiefest of *Philosophers*. The first *Movers* motion is not the cause of generation and corruption, but the motion of the *Oblique circle*: for that is continual, and hath also two *Motions*: for if generation and corruption were to be always continual, it were necessary that something should be always moved, least those mutations should fail; but yet it must have two motions, least one onely of the two mutations should succeed. The cause therefore of the continuity is the motion of the *Universe*, but the declivity it selfe is the cause of the *Approach*, and the *Recesses*. For it comes to pass, that He, (namely the *Sun*) is sometimes neerer, and sometimes farther from the earth. And when the *Interval* is inequal, the motion must be inequal too. If then he therefore generate because he approaches neerer: and cause corruption, because he removes and recedeth farther from the earth: Then it follows, that if he often do generate, it is because he often approacheth: and if he often cause corruption, it is because he often recedeth. For contraries have contrary causes.

De Gen. 6.  
Corr. l. 2.  
c. 10.

And therefore in the *Spring* all things flourish and grow; (namely, from the *Approach* of the *Sun*, who is the *Common Father*, and *Parent*: or

at

at least the immediate and Common Instrument in Generation imployed by the high Creator) and that not *Vegetables* onely, but *Animals* too: nor they onely which are *Spontaneous* issues, but those also which are generated by *Male* and *Female*. As if at the approach of this noble Planet, soft *Venus* did descend from the *Skie*, with *Cupid* and the *Graces* entertained for her *Retinue*, inciting and provoking all living things, by their *Allegeance* to *Love*, to propagate their kind. Or (as it is in the *Fable*) as if *Saturne* did then become an *Eunuch*, and threw his masculine evidences into the *Sea*, to raise a *Foam*, which might give birth to *Venus*: For in the Generation of *Animals*, *Superat tener omnibus humor*; A gentle dew doth moisten all (as the Poet hath it) and the genital parts doe foam and strut with *Seed*.

And therefore the cock and Hen are chiefly fruitfull in *Spring*, as if the *Sun*, or *Heavens*, *Nature*, the *Soul* of the *Universe*, or the *Omnipotent Deity* (for these are *Synonoma's*) were a *Superiour* and *Diviner* cause of Generation then they. So, *Sol & homo generant hominem*; The *Sun*, and *Man* beget a *Man* (that is to say) the *Sun* by *Man* as its Instrument. And so, the *Creator* of all things, and the cock, beget an egge, and out of an egge a chicken: namely, by the constant approach and recessse of the *Sun*: who according to the will, and decree of the *Almighty*, is employed in the generation of all things.

We conclude therefore that the *male* (though he be a *Primary* and more excellent efficient then the *female*) is only an *Instrumental* Efficient: and doth himselve, no less then the *Female*, owe his fecundity, or generative *Virtue* to the *Sun* his *Creditour*: and therefore the artifice and providence (which

(which we discover in his workmanship) doth not proceed from him, but God. For the Male uses neither *counsel*, nor *understanding* in generation: nor doe Men generate by any part of their reasonable soule, but by a faculty of their vegetative: which is not inrouled amongst the primary, and more divine powers of the soule, but the meanest, and basest.

Since therefore in the structure of a chicken, Art and Providence are no less visible, then in the Fabric of Man himselfe, and the creation of the Universe: we must needs acknowledge, that in the generation of Man, there is an Efficient cause more excellent then man himselfe: or else that the vegetative faculty, or that part of the soule, which raiseth this pile of man, and doth conserve it, is much more divine and excellent, and doth more personate the Image of God, then the Rational part it selfe: whose worth and dignity we more cry up, then all the faculties of the soule beside; though she were Regent and Empress of the rest, and held them all as Tributaries to her. Or at least wee must confess, that there is neither *prudence*, nor *skill*, nor *understanding* in the workes of Nature, but they seem such onely to our apprehensions, who iudge of the divine productions of nature, by our owne Arts, and Faculties, (or copies drawne by our own fancies) as if the active principles of Nature did so produce their effects, as we do our artificial issues: namely by consultation, and rules desumed from the Minde and Intellect. But Nature, which is the Principle of Motion and Rest, in all those things wherein she is: and the vegetative soule, which is the primary Efficient cause of every generation, doe move and act by no acquired faculty (as we doe) which may be distinguished



ed by the name of *Art*, or *Providence*, but work by a certain *Destiny*, and *Mandat* according to rule, after the same manner, and constraint, as *light things* fly up, and *heavy* press downwards. The *Vegetative faculty* of *Parents* doth generate, and the *seed* arrives at last at the forme of the *fetus*, after the same manner as the *Spider* spreads her *Net*, the *Bees* and *Ants* build their *Cottages*, and furnish their *store-houses* for future exigences, *Birds* compile their *Nests*, *hatch*, and protect their young: namely, *Naturally*, and by their *Mother-milk*, not by any *discursive providence*, *discipline*, or *consultation*. For that which is in us the *Principle of Artificial operations*, & is called *Art*, *Understanding*, or *Prudence*: is in those *natural effects*, *Nature*, (which is *αὐτοδιδάκτωρ*, her own Tutor, and taught by no man) and what is acquired, and a purchase in us, is in them inbred, and a Birth-right. And therefore they who look back to *Art*, are incompetent and partial *Judges* of *natural things*: for we are rather to judge of the contrary, and compare artificial productions to their *Sampler in Nature*. For all *Arts* are attained by an imitation and personating of *Nature*; and our *Reason*, or *Intellect* is deriyed from the divine *understanding*, exercised in its works. And when it is rooted in us by a compleat habit, like another adventitious acquired *soul*, reflecting a resemblance of the highest and divinest *Agent*, it produceth like effects and operations.

Wherefore (in my opinion) he is the right and pious *Philosopher*, who deduceth the *generations* of all things from that *eternal* and *Omnipotent Deity*, upon whose pleasure the *Universe* dependeth. Nor do I think we ought to contend, by what notion we call, or adore this first *Agent*, (to whom all the

the names of veneration are most due) whether that of *Deus*, or *Natura naturans*, or *Anima mundi*. For all men understand him to be that *Beginning* and *End* of all things, which is *Omnipotent*, and *everlasting*, the *Author* and *Creator* of all things, *preserving*, and *perpetuating* the *fluxibility* of mortal creatures, by the several *vicissitudes* of generations : which being every where present, is no less assistant to the particular operations of natural things, then of the whole *Universe* ; that so he may propagate all *Animals* by his *Deity*, *Providence*, *Art*, and *divine Understanding*. Whereof some are *spontaneous births*, without any *Univocal efficient* ; some born by the *associat operations* of male and female, some from one *Sex* onely ; others by other *intermediate Instruments*, which *Instruments* are sometimes fewer, sometimes more, sometimes *univocal*, and sometimes *equivocal*, and *ex accidenti*, casual.

But all *natural bodies* whatever are both the *productions*, and *Instruments* of that *Great God* ; and are either onely *natural*, as *Heat*, *Spirit*, the *tepidity* or *warmth* of the *Air*, or *Putrefaction*, &c. or *animate* also ; for he makes use in some sort of the *motions*, *faculties*, and *souls* of *animals* themselves, in order to the perfection of the *Universe*, and *production* of *Animals*.

It appears therefore in some proportion, what the *males* contribution is towards *generation* ; namely, the *cock* brings that same virtue to the *egg*, by which of a *subventaneous* it becomes a *fertile* one, as *vegetable Fruits* borrow from the *Summer heat* to ripen themselves, and fructifie their *seeds* ; and which induceth *fertility* into *spontaneous productions*, by which from *worms* they become a *Canker-worm*, and from a *Canker-worm*, they become the worm called *Aurelia*, and from an *Aurelia*,

lia, Butterflies, common Flies, and Bees, &c.

And in this manner the *Sun* by his access to the earth, is the Beginning of the motion and transmutation in the Increase of Fruits; and the End also, when he becomes the author of the fertility of their Seeds. And as in the early Spring he is the primary efficient of Leaves, Blossoms, and Fruits, so is he the last compleater of the maturity and fecundity of the Seed in the strength of Summer. For confirmation of which, amongst many other observations, I shall insert this one: There are some amongst us who manure their *Orange-trees* with a great deal of care and husbandry; so that the *Oranges* which the first year grew to the bigness of the top of ones thumb, are the next Summer mature and complete, save onely that they have no kernels, or seeds. While my thoughts were bent upon this contemplation, I fancied these *Oranges* to be a Specimen of the *Subventaneous eggs*, which are produced by the *Hens*, without the *Cocks* assistance, having all the sensible appearances or requisites of fruitful eggs, bating onely the fecundity, or propagating seed. As if the same thing were conferred by the Cock upon a *subventaneous egg*, to make it fruitful, which the *Sun* contributes in hotter climats, whereby the fruit of their trees are produced with kernels. And as if the *English Summer* were no farther usefull to some fruit, then the simple *Hens* to the *Eggs*, and were onely like the female, an impotent progenitress: which Summer in other Countries, where they enjoy a greater bounty from the *Suns* presence, were a masculine Summer, and did complete her productions.

This, by the by, that by the eggs example it might appear, what qualifications are required to a primary efficient in the generation of Animals.

For



For it is clear, that there is in an egg an operator (and also in every conception, and rudiment) which is not only infused into it from the female, but is first communicated from the male by the geniture in coition, but yet first of all contributed to the Male, from the Heavens, the Sun, or the Almighty Creator. It is likewise manifest, that this Operator or Agent, which is existent in the egge, and in every seed, is so inspired with power from the Parents, that it fashions the chicken to the likeness of the Parents, not of it self; and that a mixt likeness too, as proceeding from them both united in coition: and since all things are transacted with an admirable providence and wisdom, the presence of the divine Deity is clearly implied.

But of this we shall more largely treat elsewhere, when we shall endeavour to shew, what remains in the Female presently after coition, and where it abideth: and likewise (because nothing at all is discoverable in the cavity of the womb after coition) what that prolific contagion, or first conception is? Whether it be any corporeal thing, any where reserved in the female, or something incorporeal? And whether the conception of the womb be like the conception of the Brain, and so Fecundity be attained, as Science is? (for there are arguments not wanting to prove it) and as Motion, and Animal operations, do take their rise from the conception of the Brain (which we call the desire, or appetite); so whether do Natural motions likewise, and the Operations of the Vegetative faculty (especially Generation) depend upon the conception of the womb? Again, how that prolific contagion is of a mixt nature, and transferred from the Male into the Female, and from her into the Egge? And lastly, how the contagion, or infection of all preternatural

272 *Of the Order of Generation, and first, Ex. LI.*  
natural diseases, and distempers do spread, and  
propagate insensibly.

---

*Of the Order of Generation, and first,  
of the first Genital Particle.*

EXER. LI.

**W**Hat that is which is produced in the *Female* immediately upon coition, or doth remain in her, which we hitherto do comprise under the name of *contagion*, by which, as by Infection, the *female* is rendered fruitfull by the *male*, and afterwards doth generate a *fœtus* of her own accord, shall be said in its place, where we shall make a stricter disquisition and examination of that matter. In the mean time, we shall signifie to you, all such things as do openly display themselves in the order of the production of the parts, and are worth the *Observation*.

And first of all, because it is plain that the *chicken* is built by *Epigenesis*, or the additament of parts budding one out of another, we will discover what part is first founded before all its company, and what is observable concerning it, and the manner of its generation.

de gen. an.  
l. 2. c. 1.

That which *Aristotle* affirms concerning the generation of perfect animals, is an undoubted truth, and most apparent in an *egge*; namely, that all the parts are not framed together, but one after another in order; & that the first in being is that *genital*

Ex.LI. Of the first Genital particle.

273

tal particle; by virtue of which afterwards (as from their original) all the rest of the parts do arise. As we see in the seeds of Plants (as Beans and Acorns) a budding, or protuberant point, which is the foundation of the future Tree.

And this particle is like a Son set free, and dwelling *Ibid. c. 1.* in a mannour of his own, and a principle subsisting of himself; whence afterwards the order of the parts is delineated, and all things ordered and regulated which conduce to the complement of the Animal. For since, no part is its own parent, but when it is once begotten, doth provide for it self: therefore that part must of necessity be first made, which doth contain the principle of encrease (for be they Plants or Animals, they have all that in them which contains a power of vegetation and sustaining;) and distinguisheth also and formeth all the other parts in their due order and rank: therefore the Soul is primarily in that primogenit particle; which Soul is the fountain and author of Sense, Motion, and Life of the whole. That therefore is the principal particle, from which the vital spirit, and native heat do descend into all the rest; in which the *Physitians calidum Innatum sive implantatum*, innate or implanted warm substance, doth first display it self; and the domestick household-God or lasting fire inhabits; from whence Life floweth into the Body in general, and each particular part; from whence Nutrition, Ayde, Growth, and Comfort derive their streames: Lastly, where Life first ariseth to the born, and setteth to the dying creature. *Ib. c. 4.*

These indeed are all true of the first genital part, and do evidently appear in the generation of the chicken; and therefore, as I conceive, being moved thereunto by sundry Observations, the opinion of some *Physitians*, whose Philosophy is ill founded,

T

is



is to be rejected (whereby they decree that the three principal and eldest parts, the Brain, the Heart, and the Liver, do together spring out of the small bladders or bubbles) so neither can I assent to Aristotle himself, who concludes that the Heart is this first genital and animate particle. For the truth is, I am perswaded that this Prerogative is onely due to the Blood: for the blood is it which is first seen in Generation. And that not onely in an Egg, but in every Fetus, and animal conception whatsoever: As shall plainly appear anon.

There appears, I say, from the beginning, *Punctum Rubrum saliens*, *Vesicula pulsans*, *Fibræque inde deductæ*, the Red capering Point, the Panting Vesicle, and the Fibers deduced thence, which contain blood. And so farre as I could possibly discern by accurate Inspection, the Blood is formed before the *Punctum saliens*, and is endowed with vital heat, before it moves by pulse; and in it, and from it doth the pulsation begin. For I have found it true by sundry experiments both in an *egge*, and elsewhere, that the blood is it, in which (so long as the vital heat is not quite extinct) resideth the possibility of reviving.

And since the *Vesicula pulsans*, and the *Fibres* containing blood which are derived from it, are seen before any other parts; I conceive it consonant to reason, that the blood is made before his receptacles; that is to say, the thing contained, before the thing containing; for the latter is made to be serviceable to the former. And therefore it is most probable, That the *Veines*, and *Fibres*, and then the *Vesicle*, and after it the *Heart*, as being *Instruments* destined to receive and house the blood, are erected for the transmission, and distribution of it, and that the blood is the primary particle of the body.

And

Ex.LI. Of the first Genital particle.

275

And this is manifest by many Observations ; but chiefly, in that some *living creatures* (and such too as have *blood*) live a good while without any *pulse* at all ; and some become like *Anchorites* all the *Winter* long, and yet survive, though their *Hearts* within them do respite all their *motions*, and their *Lungs* make *Holy-day*, and forbear *respiration* ; like those persons, who in a *Syncope*, *Lipothymia*, or *Hysterical passions*, lie half-dead without the motion of the *Pulse*.

Being therefore ascertained out of those things which I have observed in an *EGGE*, and the *dissection* of *Animals* while they were alive, I conclude (against *Aristotle*) that the *blood* is the first *Genital particle*, and that the *Heart* is its Instrument designed for its *Circulation*. For the *Hearts* business or function is the propulsation or driving forth of the *blood*, as appears in all *Animals* that have *blood* : and the office of the *Vesicula pulsans* is the very same, (in the generation of the *Chicken*) which I have shewed to many persons, in the first conceptions of *Animals*, (as well as in an *EGGE*) when it hath been less than a *Spark*, panting, and in its motion, drawing it self together, and so squeezing out the *blood* contained in it, and by relaxing it self again, receiving and entertaining *blood* afresh.

And hence the prerogative and antiquity of the *blood* appears, seeing that the *Pulse* proceedeth from it. For there being two parts of *Pulsation* ; (*Distention*, and *Contraction*, or *Systole*, and *Diastole*) and the first of these motions is *Distention*, it is manifest that that action proceeds from the *blood* ; but the *Contraction* is made by the *Vesicula pulsans* in an *EGGE*, (as by the *Heart* in a *Chicken*) by its proper *fibres* ; as by an *Organ* destined to that use.

T 2

And

And it is also certain, that the said *Vesicula*, as also the *Auricula cordis*, the deaf-eare of the Heart, afterwards (from whom the *Pulsation* first begins) are incited to the *constrictive motion*, by the blood distending them. The *Diastole*, or *Dilatation*, is made by the blood boyling or swelling by the spirits within it: And so *Aristotles* Opinion concerning the *pulsation* of the Heart; (namely, that it is made by a kinde of *Ebullition*) is in some sort true. For as in *Milk* set upon the fire, and in *Beere*, we see dayly a *Fermentation*, working, or *Intumescence*; so is it in the *pulse* of the Heart, in which the blood, as by a kinde of *fermentation* working up, is distended, and then ebbs, or falls down againe: and that which befalls them *per accidens*, from an external agent (namely, an adventitious heat) that is accomplished in the blood, by its own internal heat, or innate spirit; and is also regulated by the soul in a natural way, and for the preservation of living creatures.

The *Pulse* therefore is performed by a twofold Agent; namely, the *Distention* or *Dilatation* proceeds from the *Blood*; and the *Constriction*, from the *membrans* of the *vesicula* in the *Ecge*; (but in the *Fetus* when it is born, from the *Deaf-eares*, and *Ventricles* of the Heart) and by the mutual performance of this alternate and interchanging motion, the blood is driven round the whole body, and so our lives continued.

Nor is the *Blood* therefore onely to be called the *Primigenial* and *principal part*, because that in, and from it the fountain of motion and *pulsation* is derived; but also, because the *Animal heat*, or *vital spirit* is first radicated and implanted, and the soul takes up her first mansion in it. For wheresoever the immediate and principal Instrument of the  
vegetative



*vegetative faculty* is first found, there in probability the *soul* first resides, and takes her Beginning; as being inseparable from the *spirit*, and the *calidum innatum*.

For however in *Artificial Operations* (as Fabri-  
 cius rightly admonisheth) the *Artificer* and the *In-* pag. 28.  
*struments* are separated; yet in the works of Nature they are conjoynd, and one and the same: so the *Stomack* is both the *Author*, and the *Instrument* of *chylification*. So in like manner, the *Soul* with the *Spirit* (her *Instrument*) is immediately conjoynd; and therefore be it in what *part* it will, that *heat* and *motion* first begin, there also the *Life* doth first arise, and last expire; and out of question, the most intimate domestick *Deities*, and *Soul* it selfe, are there enshrined.

*Life* therefore consists in the *blood*, (as we read *Levit. 17.*  
 in *Holy Scripture*) because in it the *Life* and *Soule* 11. & 14.  
 do first dawn, and last set. For I have experimented in the *dissection* of many *live Animals*, that when the *body* was now a dying, and breathing done, the *Heart* continued its pulse a while, and kept up *life* in it. And when the *Heart* hath now given over, you shall discern a *motion* yet surviving in the *Auricula*, or *Deaf-ear*s; and though the other faile, yet the *Right* will still be stirring; and when that submits to *Fate* too, yet you shall perceive a kinde of *undulation*, or waving to and fro, and obscure *trepidation*, or *palpitation* in the *champion-blood*, proclaiming that he gave the last blow. And any man may plainly see, that the *blood* retaines heat, (that *deriver* of *Life* and *Pulsation*) when all the other *parts* are chilled, and cold: which heat when it is quite extinct, as the *blood* is then no longer *sanguis*, sed *cruor*, *Blood*, but *Gore*; so now no longer hope of returning back to *life*.

T 3

But,

But, both in an *Esge*, and in gasping *Animals*, after all *pulsation* is expunged, if you apply a gentle warmth either to the *Punctum saliens*, or the right *Auricle* of the *Heart*, you shall presently see the *motion*, *pulsation*, and *life* set on foot again by the *Blood*; except he have quite fore-gone all his *innate heat*, and *vital spirit*.

By all which it is most evident, that the blood is the *Genital Part*, the fountain of *Life*, *Primum vivens*, & *ultimum moriens*, the *First-born*, and the *Longest Liver*, and the chief *Palace* and *Court* of the *soul*: in which (as in its *Spring-head*) the heat doth first and chiefly flow, and flourish: and from which all the other parts of the *Body* derive their life and influent warmth. For that heat streaming with the blood, doth sprinkle, cherish, and preserve the whole: as we have heretofore demonstrated in our Booke, *de Motu sanguinis*.

And therefore *Blood* is found in every particle of the *Body*, nor can you find footing for the point of a needle, or the edge of your naile, where you shall not immediately start the blood: as if, were it not for the *blood*, the body would enjoy no heat, nor life. Therefore the *blood* being never so little concentrated and fixt, (*Hippocrates* calls it, *αἷμα σφικτικόν*) as it is in *Swonning*, *frights*, *extream cold weather*, and the approach of the *Paroxysme* or *fit* of an *Ague*, you shall presently behold, the whole *body* freeze, and grow stiff, and languish in a pale and livid complexion: but the *blood* being summoned back, by applied *Fomentations*, *exercise*, or *affections* of the *Mind*, (as *Joy*, or *Anger*) how nimbly do all parts recover their *Heat*, *Floridnesse*, *Vigour* and *Beauty*.

And hereupon the ruddy sanguine parts alone, are

are called the Hot parts, as the *Flesh*; but the *white* and *bloodless* parts, as the *Nerves* and *Ligaments*, the Cold. And as Sanguineous Animals exceed the bloodless; so even in the parts, those that are more liberally indowed with Blood, are counted the Eminent parts. And the Liver, Spleen, Reins, Lungs, and Heart it self (if you strain all the blood out of them, for whose sake they are chiefly called *Viscera*) they presently grow pale, and wan, and are to be registered amongst the colder parts.

The Heart himselfe, I say, doth by the *Coronary Arteries* receive the Blood, its influent *heat* and *life*, both which it enjoys upon no other account, then the meer bounty of the *Blood*. Nor can the *Liver* proceed in its *publick* office, without the influence of *blood* and *heat* from the *Celiacal Artery*. For there is no where any affluence of *heat*, without an Influence or influx of *blood* by the *Arteries*. And therefore in the first Confirmation of all the parts, before they put themselves into publick undertakings, they are to be discovered *pale*, and *blood-lesse*: hereupon the old *Physitians* and *Anatomists* supposed them to be *spermatical* parts, and this speech was wont to obtain amongst them, that in Generation, *Aliquot in Lacte dies absumuntur*, some daies are spent in the *Milk*, that is about the Constitution of the *white*, *Spermatical* parts. The very substance of the *Liver* it self, the *Lungs*, and the *Heart*, at their first appearance are exceeding *white*. Nay the *Cone* of the *Heart*, and the *walls* or *sides* of its *Ventricles*, are even then *white*, when the *Auricula* are full, and dyed with *Scarlet-blood*, and the *Coronary Vein* looks ruddy. So likewise the *Parenchyma* of the *Liver* is it selfe *white*, when the branches and propagations of its



Veins are blushing with *blood*: nor doth it execute its *publick office*, untill it be thoroughly drenched with *blood*.

And lastly, the *blood* doth so surround, and peirce into the whole *body*, and impart *heat* and *life* to all its *parts*, that the *soul* may justly be counted resident in it, and for his sake, *Tota in tota & tota in qualibet parte*, to be all in all, and all in every part, (as the old saying is.)

But it is so far from truth (which yet *Aristotle* and all *Physitians* affirm) that the *Liver*, or *Heart* is the *Author* of the *Blood*: that the contrary, out of the *fabrick* of the *chicken* in the *egge*, is most manifest: namely, the *Blood* rather is the *Author* of the *Heart*, and *Liver*. And this also *Physitians* before they are aware seem to acknowledge, while they conclude that the *Parenchyma* of the *Liver* is a certain affusion, or conflux of *Blood*: as if it were nothing else but *blood* congealed. Now it must have a being before it can be affused, or coagulated: and that it is so, *experience* her self openly displays; for *blood* appears in the *egg*, before there be any *track* or *Rudiment* of any such thing as the *Body*, or any of the *Viscera*. And yet no *blood* can come thither from the *Mother* to the *Fetus*, (as people commonly phansie in *Viviparous productions*.)

The *Liver* of *Fishes* is alwaies *whitish*, though their *Veins* are *purpled*, and *dark*. And our *Hens* the better they are crammed, so much the more do their *Livers* impair, and grow *pallid*. *Green-sickness Virgins* that are *Cacheetical*, as the *habit* of their *bodies* is *pale*, so is their *Liver*: an evident signe of the penury and dearth of *Blood*. Therefore the *Liver* borrows his *heat* and *complexion* from the *blood*, and not the *blood* from him.

Hence

LI.  
cute  
hed  
and  
and  
oun-  
a &  
n e-  
tole  
Heart  
your  
ma-  
or  
be-  
while  
er is  
were  
must  
ula-  
enly  
fore  
hing  
t no  
Fe-  
rous  
ough  
Hens  
more  
een-  
it of  
dent  
ere-  
rion  
ence

Ex.LII.Of the Blood, as it is the principal part. 281

Hence it is plaine, that *blood* is the *prime genital Part*, whence the *soul* primarily results, and out of which the *primary animate part* of the *Fætus*, which is the fountain of all the rest, both *similar*, and *dissimilar* is derived, which by that means attain their *Vital heat*, and become subservient to it: And the *Heart* is erected for this end and purpose onely, that it may by continual *pulsation* (to which the *Veins* and *Arteries* are ministerial and subservient) entertain this *blood*, and spout it out again up and down through the whole *body*.

All which is the clearer discovered by this, that the *Heart* hath not a *pulsation* in all *Animals*, nor yet at all times; when yet the *blood*, or something proportionable to *blood* is never wanting in any.

---

Of the Blood, as it is the Principal Part.

E X E R. LII.

IT is therefore evident, even to the *Eye*, that the *blood* is the *Primigenial*, and so the *Genital part*: & that all those attributes recited in the precedent Chapter are consistent with it: namely, that it is the builder and preserver of the *body* and *principal part* wherein the *soul* hath her *Session*. For (as we newly said) before any particle of the *body* appear, the *blood* is born, and groweth, having a palpitation (as *Aristotle* saith) within the *Veins* moving

De hist.an.  
l. 3. c. 19.

ving to and fro with a Pulse, and is above all the humours dispersed through the whole body. And so long as life doth last, the Blood alone is Animate, and hot.

Moreover, by his various motions, in celerity, or slowness; vehemence, or feebleness, &c. He plainly discovers his resentment of the affronts which any thing casts upon him, and the friendships of such as cherish him. We therefore conclude, the blood lives and is nourished of it selfe, no way depending upon any other part of the body, as elder or worthier then it self. But whether the whole body depend upon it, as being postgenit, adjoined, and a kind of appendix or retainer to it, is not the business of this place. I shall only adde, what Aristotle confesses, Truly the nature of the blood is the cause, why very many things befall Animals, both in order to their manners and sense. So that hence we may perceive the Causes not of life onely in general, (for you can never discover any other *Caldum innatum aut influens*, innate or influent heat which may be the immediate instrument of the soul, besides the Blood) but also of longer or shorter life, or sleep, and wakefulness, of Wit and Strength &c. For by its tenuity (saith Aristotle in the same place) and cleanness or purity, creatures are wiser, and have quicker senses: and likewise are either more timorous, or couragious, angry and furious: according as their blood is more dilute and thin, or more compact and grosse by fibres.

Nor is blood the Author of life onely, but according to its severall discriminations, it is the cause of health, or diseases. And Poysons themselves, which assault us from without, (as poisoned darts or bullets) did they not infect the blood, would do us no prejudice. So that our life, and wellfare is derived unto us from the same spring. If the blood

De part.  
an. l. 2. c. 4.

Hist. an. l.  
3. c. 9.



Ex.LII.Of the Blood,as it is the principal part. 283

blood be over liquid,saith Aristotle,men grow sick;for it degenerates into so serous a gore, that some have sweet Blood. If too much of it stream out, they die. For by want of blood, all the parts do not onely languish presently, but the Animal it self soon expires. I conceive it inconvenient to set down Experiments to confirm this, because they require a peculiar Tract. I perceive that the wonderful Circulation of the blood, first found out by me, is consented to almost by all: and that no man hath hitherto made any objection to it, greatly worth a confutation: Wherefore if I shall subjoine the causes, and benefits of that Circulation, and lay open some other secrets of the blood,as, how much it conduceth to the happines of the creature, as also to both soul, and body, that so men may be cautious to preserve their blood pure and clean, by commodious diet,I conceive I shall perform an office, not more new, then useful, and acceptable to Philosophers, and Physitians: nor will this opinion seem so improbable and absurd to any, as once to Aristotle; namely, That the Blood, like a Tutelar Deity, is the very soul in the body, as Critias of old, l. 1. c. 2. and others thought, supposing sense to be the chiefe property of the soul, and that sense to be in her by the nature of the Blood. Now some concluded it to be the soul, because it hath a power of moving by its owne nature: As Thales, Diogenes, Heraclitus, Alcmaeon, and others.

But that both sense and motion are in the Blood, De hist.an. is conspicuous by many tokens, though Aristotle l. 1. c. 19. denied it. For if he himself compelled by the truth of the thing it self, did confess, that there was a soul in an egge, though the egge were addle: and that in the Geniture and Blood was found a divine substance, proportionably answering to the Matter of the

*the Stars*, and that it was the *Creators Vice-Roy*: If some of the *Moderns* say, that the seed of *Animals* ejected in *Coition* is *animate*, Why should we not upon as good reason say, that there is a soul in the *Blood*? and seeing it is the first begotten, first moved, & first nourished, why should we doubt to affirm, that the *soul* is first raised, & kindled out of it? *Blood* is that, wherein the *Vegetal* and *sensative operations* first shine forth: in which the primary and immediate officer of the soul, is bred; which is the common tie of soul and body; and in which, as in her *Chariot*, the *soul* visits and scattereth influence upon all the parts of the body.

Besides, since the contemplation of *Geniture* is (as we have seen already) so difficult, (namely, how the *fabrick* of the *body* should be built by it, with providence, art, and divine understanding) why should we not by the same right, admire the excellent nature of *blood*, and harbour as worthy thoughts concerning it, as *seed*? especially seeing the *Geniture* it self (as appears by the *egge*) is made of the *blood*; and all the whole *body* (as from its *Genital part*) seems not onely to desume its first Foundation, but Preservation also, from it.

Thus much by the way concerning this matter, being to treat more fully and exactly of it elsewhere. Nor do I conceive it worth the trouble, to dispute here, whether the definition of a *part* in its proper acceptation agree to *blood*? which some deny upon these grounds chiefly, because it hath *not sense*, and because it flowes and insinuates into all the *parts* of the *body*, to cater convenient dyet for them. But I have found many things about the manner of Generation, by which being convinced, I shall establish the contrary to those things, (which *Philosophers* & *Physitians* commonly

Ex. LII. Of the Blood, as it is the principal part. 285

ly affirm, or deny.) At present I will onely say, that in case we should consent that the *blood* hath not *sense*, yet it cannot be thence inferred, that it is no part of the *sensitive body*, and that the chifest too. For neither the *Braine*, nor the *Spinal Marrow*, or the *Crystalline*, or *Glassie humour* of the *Eye* have any *sense*, and yet all *Philosophers* and *Physitians* do to this day with one consent, allow them to be *parts* of the *body*. But *Aristotle* did number it amongst the *similar parts*, and *Hippocrates* also; for while he constitutes the *Animal body*, out of *containing*, and *contained parts*, and *impetum facientibus*, *spirits*, he did necessarily own the *blood* amongst the *contained parts*.

But of this more at large, when we enquire what a *part* is, and how many several acceptations there are of it. In the mean time, we will not conceale this *Admirable Experiment* (by which it shall appear that the most principal member of all, namely, the very *Heart* it self, may seem to be insensible.)

A Noble young Gentleman, Son and Heire to the honorable the *Vice-Count* of Mountgomery in *Ireland*, when he was a *childe*, had a strange misshapp by an unexpected fall, causing a *Fracture* in the *Ribs* on the *left side*: the *Bruise* was brought to a *Suppuration*, whereby a great quantity of putrified matter was voided out, and this putrefaction gushed out for a long while together out of the wide wound. I deliver it from his own mouth, and the testimony of other *creditable persons*, who were *eye-witnesses*. This person of Honour, about the eighteenth, or nineteenth year of his *Age*, having been a *Traveller* in *Italy* and *France*, arrived at last at *London*: having all this time a very wide gap open in his *Breast*, so that you might see and touch his



his *Lungs* (as it was believed.) Which, when it came to the late King *Charles* his ear, being related as a *miracle*, He presently sent me to the Young Gentleman, to inform *Him*, how the matter stood. Well, what happened? When I came neer him, and saw him a sprightly Youth, with a good complexion, and *habit of body*, I supposed, some body or other had framed an untruth. But having saluted him, as the manner is, and declared unto him the Cause of my *Visit*, by the *Kings Command*, he discovered all to me, and opened the void part of his *left side*, taking off that small *plate*, which he wore to defend it against any blow or outward injury. Where I presently beheld a vast *hole* in his *breast*, into which I could easily put my three Fore-fingers, and my Thumb; and at the first entrance I perceived a certain *fleshy part* sticking out, which was driven in and out by a reciprocal *motion*, whereupon I gently handled it, in my hand. Being now amazed at the novelty of the thing, I search it again and again, and having diligently enough enquired into all, it was evident, that that old and vast *Ulcer* (for want of the help of a skillfull *Physitian*) was miraculously healed, and skinned over with a membrane on the *Inside*, and guarded with *flesh* all about the brimmes or margin of it. But that *fleshy substance* (which at the first sight I conceived to be *proud flesh*, and every body else took to be a *lobe* of the *Lungs*) by its *pulse*, and the differences or *rythme* thereof, or the time which it kept, (and laying one hand upon his *wrist*, and the other upon his *heart*) and also by comparing and considering his *Respirations*, I concluded it to be no part of the *Lungs*, but the *Cone* or *Substance* of the *Heart*; which an excrecent fungous *Substance* (as is usual in foul *Ulcers*)

had

Ex. LII. Of the Blood, as it is the principal part. 287

had fenced outwardly like a Sconce. The Young Gentlemans *Man* did by dayly warm injections deliver that fleshy accretion from the filth & polutions which grew about it, and so clapt on the Plate: which was no sooner done, but his *Master* was well, and ready for any journey or exercise, living a pleasant, and secure life.

Therefore, instead of an *Account* of the *Business*, I brought the Young Gentleman himself to our late *King*, that he might see, and handle this strange and singular Accident with his own *Senses*; namely, the *Heart* and its *Ventricles* in their own pulsation, in a young, and sprightly Gentleman, without offense to him: Whereupon the *King* himself consented with me, That the *Heart* is deprived of the *Sense* of *Feeling*. For the Party perceived not that we touched him at all, but meerly by seeing us, or by the *sensation* of the outward *skin*. We likewise took notice of the *motion* of his *Heart*; namely, that in the *Diastole* it was drawn in and retracted, and in the *Systole* came forth, and was thrust out; and that the *Systole* was made in the *heart*, when the *Diastole* was sensible in the *wrest*; and also that the proper *motion* of the *heart* is the *Systole*; and lastly, that the *heart* then beats upon the *breast*, and is a litle prominent, when it is lifted upwards and contracted into it self.

Nor is that other Controversie (namely, whether the *Blood* do onely serve to nourish the *Body*) to be much insisted upon in this place. *Aristotle* indeed doth in several places contend, that the *blood* is *Alimentum ultimum*, the last Aliment, and with him the whole School of *Physitians* give suffrage. And yet many things hard to be unfolded, and of bad coherence, will ensue upon that opinion. For, when *Physitians* treat of the *Blood* in  
the

the *Physiological part of Physick*, and declare the onely use and end of it to be, to administer nutriment to the *Body*: they compound it of the four *juices*, and *humours* of the *body*; grounding that composition upon the combinations of the *four first qualities*: and thereupon they affirm, the *mass* of the *blood* to be compounded of both the *Cholers*, (namely, the *yellow*, and *black*;) the *Phlegmatical humour*, and the *Blood*. And for that cause, they recite the four sorts of *humours*, whereof the *moist* and *cold* one is called *Pituita*, the *Phlegmatical humour*; the *cold* and *dry*, *Melancholia*, *Melancholy*; the *hot* and *dry*, *Bilis*, *Choler* simply, or *yellow Choler*; and lastly, the *hot* and *moist*, *Sanguis*, *Blood*. Moreover, of each of these three first kindes, they say, Some are *Nutritii*, *Nutritive* (of which the whole *Body* consists;) others, *Excrementii*, *Excrementitious*. And out of the *Nutritive humours* (as out of *heterogeneous parts*) they conceive the *Blood* is compounded: and yet so, that the *Phlegmatical humour* is so crude, as that the *Native heat* (though stronger then it) cannot convert it into laudable *blood*: and so, they likewise deny that *Choler* can convert into *blood*, though they affirm, that *Blood* is easily turned into *Choler*, and *Choler* into *Melancholy* (by the excess of the *Concocting heat*.)

Which if it be true, and there be no *Regress* allowed; namely, from *Melancholy* into *Choler*, and from *Choler* into *Blood*: they ought then to say, that all those recited *Humours* are in order to *Melancholy*, and that *Melancholy* is the chief, and most concocted nutriment. Nay, they must of necessity grant a two-fold *blood*; namely, that whole *mass* of *blood* contained in the *veines*, compounded of those four *humours*; and also that *purer*, more florid,

rid,



Ex. LII. *Of the Blood, as it is the principal part.* 289

rid, and *spiritual part* of it, which they call *blood* in a stricter acceptation: which some contend to run in the *Arteries*, and therefore being channelled apart from the other *blood*, they depute it to other uses. Whereupon it follows upon their persuasion, that the *pure blood* is not the *aliment*, but only the *commixt juices*, or rather *Melancholy*, to which the other humours tend at last. *Aristotle* De part. an. l. 2. c. 3. also, as he thought the *blood* was instituted for nutriment sake, so he likewise thought it compounded as it were of *parts*; namely, of a something thick substance, and blacker, which upon concretion doth subside in the bottom of the *Sawcer*, and that he counted to be the *baser part*. For the *blood*, saith he, if it be sound, is red, and tasteth sweet; but if it be vitiated either by nature, or disease, it groweth blacker. He would also have it consist of a *fibrous part*, or of *fibers*: which *fibers* being taken away, saith he, the *blood* will neither congeal nor thicken: Also in the *Blood* he did own a *sanies*, or watry blood. *Sanies*, saith he, *sanguis inconcoctus est*, the watry blood is unconcocted blood, either because it is not as yet thoroughly concocted, or that it is dilute and washy after the manner of the *Serum*. And this he counts the colder part of the *Blood*; but the *Fibers*, the earthy part of the *Blood*. Ibid. l. 3. c. 19.

Wherefore, according to his opinion, the *blood* of *Animals* is divers; in some, more *serous* and *thin*, and as it were a *sanies*, or *Ichor*, a kinde of *Gore*, or washy *Blood*, as in *Insects*, and colder and imperfecter *Animals*: in some, grosser, and more *fibrous*, as in the *Bore*, the *Oxe*, and *Ass*, &c. and in some (whose temperament is vitiated) the *blood* is *black*: but in others again, *clean*, *sincere*, and *florid*; as in *Birds*, and chiefly in *Men*.

By which we see, that both *Physitians*, and *Ari-*

*Aristotle*, did constitute the blood out of parts and differences in some manner alike. *Physitians* indeed do onely take notice of humane blood, and of that as it spins into a Sawcer in *Phlebotomy*, and so coagulates. *Aristotle* contemplates the blood of all creatures in general, or that which beareth an Analogy with blood. But laying aside all cavil, and omitting the inconveniences which do pursue their opinion, I shall briefly touch upon those things, which they both consent in, and are plainly discovered by sense it self, and are more pertinent to our business: intending elsewhere to examine them at large.

Though (as I have informed you) the blood is called a part of the body, and that the *primigenial* and *principal* part; yet if it be considered in the whole lump (as it is in the *Veins*) nothing hinders, why we may not say, that it contains *Aliment*, concocts it, and doth apply it to all parts: and that being one and the same thing, yet in that acceptation it may be said, both to feed, and to be fed, as also to be both the material and efficient cause of the Body: and naturally to have that very constitution, which *Aristotle* conceived to be necessary in the *primigenial* part; namely, that the blood is partly of a similar, and partly of a dissimilar constitution. For, saith he, Since for senses sake it is necessarily ordered, that there should be similar members in Animals; and since both the power of sensation, motion, and nutrition, are all comprehended in the same member, (namely the *Primogenit*) it is necessary that that member (which contains such principles in it) should both be simple, that it may be capable of all sensible objects; and also dissimilar, that it may move, and act. Wherefore, he goes on, in the race of creatures that have blood, the Heart is counted

Ex. LII. Of the Blood, as it is the principal part. 191  
ted such a member : but in the bloodless, that member  
which is proportionable to the Heart.

Now if by the Heart he understand that particle which is first seen in the Egge ; namely, the Blood, together with its receptacles (the *Vesiculae pulsantes*, and the *Veins*) as one and the same Organ ; I then conceive he speaks most true : for the Blood as it is discovered in the Egge and the *Vesicula*, is partly similar, and partly dissimilar. But if he understand it otherwise, that which is seen in the egge, will easily confute him : for the substance of the Heart, being considered without the Blood (namely, its *Cones*, and the *Walls* or *partitions* of its *Ventricles*) is generated long after : and continues so long white, without any irrigation of blood upon it, untill the Heart be fashioned into an Organical form, such as may spout the blood through the whole body. Nor doth the Heart, then, appear of a similar or simple constitution (as is fit for a *Primogenit* part to do) but *fibrous*, *fleshey*, and *musculous* : and indeed (as *Hippocrates* would have it) a plain *Muscle*, or Instrument of motion. But, the blood, (as it is first seen, and as it beats being yet comprehended in the *Vesicula*,) is plainly of that constitution, which *Aristotle* judgeth necessary to a *Principal* part. For the blood, while it is in its natural constitution in the body, is altogether similar. But so soon as it is dislodged, and out of its receptacles, and puts of its native heat ; it presently degenerates into several parts, as some dissimilar thing.

But if the blood were naturally designed onely to the nourishing of the body, it would be onely of a similar constitution ; like the *Chyle*, or *White* of an egge ; or at least it would be a mixt body, being compounded of the foresaid parts or juices,



292 *Of the Blood, as it is the principal part.* Ex. LII.

and yet truly one : as those other *juyces* ; namely, the *Choler* and *Phlegme*, which after death, even when they are taken out of their habitations, remain the same, as when they were seen in the live body : but are not so soon changed.

Wherefore, what *Aristotle* attributes to a Principal part, that very same thing is proper to *blood*. For *blood*, as it is a Natural body, being an Heterogeneous, or Dissimilar substance, is compounded of those *parts*, or *juyces*. But as it lives, and it the chief Animal part, compounded of a body and soul. But when that soul, by reason of the expiration of the native heat, doth vanish, and its native substance is presently corrupted, and is dissolved into those parts, of which it was formerly made : namely, first into a Watry Blood, next into Red, and White parts : and the Red parts, which are uppermost, are most florid : but those that sinck downwards grow dark, and black. Now some of the parts also are *fibrous*, and thicker, as being the tye, and connexion of the rest ; others are *ichorous* and *serous*, upon which the coagulated lump useth to float. And into this *Serum* almost all the *blood* degenerates. Now these parts are not in the live *blood*, but onely when it is now corrupted and dissolved by death.

Besides the recited *parts*, there is seen in hotter and stronger Animals, as in Horses, Oxen, and Men also of a more lively constitution, another part of *blood*, which when the *blood* is let out and grumeth, seating it selfe in the upper part of the redder *blood*, doth condense, and plainly resemble a Gelly made of *Harts-horn*, or kind of *Mucilage*, or thicker white of an egge. The vulgar count it the *Phlegme*, and *Aristotle* the crude and unconcocted part of the *blood*.

I have

Ex. LII. Of the Blood, as it is the principal part. 293

I have observed this part, to differ, as well, from the *serous*, (upon which the coagulated gore useth to swim) as from the other parts, as likewise from the Urine, which is drained by the Kidnies from the *blood*. Nor is it to be thought the cruder and colder part of the *blood*, but the more *spirital*, as I suppose, and that by two experiments; First, because it swimmes above the *florid* and brighter part of the *blood*, (which is vulgarly conceived to be the *Arterial blood*) as being hotter, and fuller of *spirits* then it, and upon the disgregation of the *blood*, obtaines the upper place.

Also in breathing a *Veine*, this sort of *blood* (whereof there is plenty in persons of a hot temperature, that are strong and fleshy) it darts it self out in a longer stream, and more vehemency (as if it spirited out of a Syringe) & hereupon we count it hotter, and more *spirital*: as that *geniture* is counted most fertile & fraught with *spirits*, which leaps farthest and most forcibly.

And that this *gelly* doth much differ from that *ichorous* and *watry substance*, which (as being colder then the rest) sinketh down to the bottom of the *sawger*, is evident for two reasons: for the *watry* and *watshy* part is more crude and inconcocted, then that it may be wrought up into perfect *blood*. But the *gelly*, which is thicker and more *fibrous*, swimming above the *lump* of *blood*, appeareth more concocted and elaborate then it. And therefore in the solution or partition of the *blood*, this *gelly* keeps aloof, the *whey* or *sanies* lowest, but the *lump* and *red parts* (as well the brighter as the darker) possess the *middle region*.

Now is it most certain, that not onely that part, but all the *blood*, nay the very *flesh* it self (as

may be observed in Bodies banged in Chains) may be corrupted into *ichorous whey*. As being resolved into that substance, of which they were first compounded: so *Salt* is resolved into *Lie*, from whence it first sprung. So likewise in every *Cachexie*, the blood that is let, abounds with plenty of *Serum*: so that sometimes there scarce appears any *grumous part* at all, but all the blood seems to be one entire *washy gore*; as we finde in that kinde of *Dropsie* called *Anasarca*: and it is also natural in creatures that are *bloodless*.

Likewise, if you breath a *veine* immediately after you have eat and drank, (before the second concoction be finished, and the *Serum* descended through the *Kidnies*) or upon the first approach of a fit of an *Ague*, you shall finde the blood to be *washy*, incoacted, and mingled with much *whey*. But on the contrary, if upon an empty *Stomack*, or discharge of the *Urine*, or a large *Sweat*, you open a *Veine*, you shall finde the blood thick (as being quite destitute of *Serum*) and being almost all condensed into a *lump*.

And as when the blood growes raw and crude, you shall perceive but very little of this *gelly* floating a top. So if you poure out the *Serum* separated from the *lump* or *mass*, and let it simmer upon a gentle fire, you shall soon see it changed into this *gelly*: which is a manifest signe, that that *washy* or *serous substance*, which is now divided from the rest of the blood, is perhaps some matter of the *Urine*, but not the *Urine* it self, though in colour and consistence it look like it. For the *Urine* being boyled, is not thickned into a *fibrous Gelly*, but rather into a *Lie*: but this *washy* or *serous part* being a while gently *beated*, condenseth into a *gelly* like that above: as on the contrary, that



Ex.LII. Of the Blood, as it is the principal part. 295

that mucago, or gelly, degenerating into more crudity by corruption, is dissolved into Serum.

And thus farre have I brought this part of the blood (which is my own Observation) upon the Stage; of which (and the other parts of blood, which are apparent to sense, and allowed by the authority of Aristotle, and Physitians) I shall more copiously discourse hereafter.

In this place, not to digress farther, I conceive the blood to be taken (with Aristotle) not as it is simply understood, and called Cruor, but as it is a living part of an Animal body. For so Aristotle: *De gen.an. l.2.c.3.* The blood is hot in such a sense, as if we could call hot water by one onely word, and not as a subject receiving heat into it. For heat is in the essence of the blood; as whiteness, in a white man. But when blood is made hot by any distemper, or passion of the Minde, it is not then calidus per se, hot, by its own heat. And thus we may say of that which is moist, or dry. Wherefore, partly a hot, and partly a moist substance is in the nature of such kinde of things; but if you divide them, they then grow cold, and congeale; and such is blood.

Blood therefore as it is a living part of the Body, is of a doubtfull nature, and falls under a twofold consideration. And therefore materialiter & per se, it is called nutriment; but formaliter, as it is endued with heat, and spirits, (which are the immediate instruments of the Soul) and with the Soul it self: it is to be counted the Bodies Genius, and Conserver, the Principal, Primogenit, and Genital part. And as a Prolifical egg is the Matter, Instrument, and Efficient cause of the Chicken, and as all Physitians count the geniture of both Sexes mingled in the womb after coition, both for the material and efficient of the Fetus; so, upon a better right, may we affirm, That the Blood is both the Matter and

Preserver of the Body, and not the bare *Aliment*. For it is a known thing in *Creatures* that are starved by hunger, and Men also that dye of *Consumptions*, that a great quantity of blood remains in their *Veins* even after death. And also *Young men* that are in their growth, and *Old men* that are declining, have a proportionable quantity of blood; namely, according to the increase, or diminution of their *Flesh*. So that the blood is a part, and not the *nutriment* onely of the Body. For if that were the onely use of it, no man would be starved, so long as any drop of the blood remains in the *veins*, as the flame of a *Lamp* doth not expire, so long as any oyle at all remains to support it.

But while I affirm the *soul* to reside first, and principally in the blood, I would not have any man hastily to conclude from hence, that all *Blood-letting* is dangerous, or hurtfull; or believe with the *Vulgar*, that as much of blood, so much of life is taken away, because *Holy-writ* placeth the life in the blood. For dayly experience shewes, that *Letting blood* is a safe cure for several *Diseases*, and the chiefest of *Universal Remedies*: because the default, or superfluity of the blood is the seminary of most *distempers*; and a seasonable evacuation of it, doth often rescue men from most desperate maladies, and Death it self. For look how much blood is according to *Art* taken away, so many years are added to the *Age*.

*Nature* her self was our Tutor here, whom *Physicians* transcribe: for She, of her own accord, doth many times vanquish the most mortal *Infirmities* by a plentifull and critical evacuation, either at the *Nose*, *Hæmorrhoids*, or by *menstruous Purgations*. And therefore young people, who feed high, and live idly, unless about the *eighteenth* or *twentieth* year

years of their age (at which time the Stock of blood encreases, together with the bulk of their bodies) they be disburdened of the load and oppression of their blood, either by a spontaneous release at the Nose, or Inferiour parts, or by breathing a Vein, they are dangerously set upon by Feavers, Small-pox, Head-aches, and other more grievous Distempers and Symptoms. Alluding to which, the Farriers, do begin almost all Cures of Beasts with Letting blood.

---

*What Observations are to be collected  
from the Ramifications of  
the Umbilical veines  
in the Egge.*

EXERCIT. LIII.

WE see the Blood is made in the Egge and Conception before any thing else; and neere upon that time, doe its Receptacles, that is, the Veines, and Vesicula pulsans appear. And therefore if we admit the Punctum saliens, together with the blood and veines, as one and the same Organical part, visible in the first dawning of the Fetus, to stand for the Heart (whose Parenchyma doth afterwards, in the formation of the Fetus, grow to the Vesicula;) it is clear then, that the Heart under this acceptation (namely, as an Organ compounded of a Parenchyma, Ventricles, Deaf-ears, Vessels, and Blood) is truly (according to Aristotles owne minde)



minde) the principal and primary part of the body : and yet its first and chief part is blood ; and that not onely in order of Nature, but of Generation too.

The parts next in Generation to the blood, are the *Veines* : for the blood must needs be kept in vessels. And therefore (as Aristotle observed) there are found two venal Channels neer upon the very beginnings of all, which do afterwards (as we have taught in our History) constitute the Umbilical vessels.

From their Scituation therefore and Ramification, some things come to be observed. The First is, that all the *Veins* and *Arteries* arise from the heart ; for they are as so many retainers belonging to the Heart, or as certain parts of it. If therefore you diligently observe a (humane or any other) *fetus* new born, and cutting in sunder the *Vena Cava* between the right *Auricle* of the Heart, and the *Diaphragma*, if you mark it as it looks downwards, you shall discover three *Holes*, whereof the greatest and hinder-most tending towards the *Spine* of the back, is the Hole of the descending *Vena Cava* ; the fore-most, and lesser, is carried into the Root and Trunk of the Umbilical vessels ; the third, and the left of all, passeth into the Liver, and is the Fountain and Trunk of all the branches disseminated into the Gibbous part of the Liver. By which it is evident, that the veins do not (as some would have it) proceed from the Liver, as from their Original, but from the Heart : unless they will obstinately affirm, that the Trunk and body of a vein arises from some little branch of the vein, and not the branches from the Trunk.

Moreover, since the fore-said vessels in the Egg, are alike disseminated into the Yolk and White (after

(after the manner as Plants work in their Roots into the Ground) it appears, that both their *liquours* are the nutriment of the *Fetus*, and that that *nourishment* is by these *Vessels* conveyed into it: and that against *Aristotle*, who every where affirms, that the *Chicken* assumes *nourishment* by the Navel, *only from the Yolk*, but is made of the *White*. The *White* indeed is first spent, and the *Yolke*, though late, doth yet at last become the Nutriment, and supplies the place of *Milk* when the *Chicken* is now hatcht: to the intent, that Nature might afford to *Oviparous* creatures such an aliment as she holds out to *Viviparous* by the *Breasts*, or *Udder*. Hereupon it falls out, that when all the *White* is exhausted, the *Yolk* continues almost entire, even when the *Chicken* is consummate, and complete; nay, even after his *Exclusion*.

*Aristotle*, indeed, ten dayes after the *Chickens* exclusion, found some remainder of the *Yolk* in the *Chicken*: but I have observed even after six weeks time, some part of it fastned to the *Guts* in the *Chickens* belly.

Yet upon the reception of the *Yolk* into the *Abdomen* of the *Chicken*, (which while the *Fetus* is forming, and growing, doth not abate so much as the *White*, but continues almost entire, when both the *Whites* are now quite wasted) and also upon the *Observation* at the *Distribution* of the *Veins* through the substance of the *Yolk*: all which being collected into one *Trunk*, do pass into the *Vena Porta*, and do carry part of the *Yolk* thither, to receive a further concoction in the *Liver*; upon these, I say, and such like grounds, I cannot but acknowledge with *Aristotle*, that the *Yolk* doth nourish the *Chicken*, and hath some analogie to *Milke*.

The

De hist.an.

l. 2. c. 3.

De gen.an.

l. 3. c. 1. &



The *Yolk* doth not remain entire after the Consummation of the *Fetus*, for a portion of it is dissolved in the first conformation of the *Chicken*; and it likewise doth admit the propagations of the *Veines* (as well as the *White*) by which after it is now prepared, it becomes the Nutriment of the *Fetus*: yet certain it is, that the greatest part of it doth survive the wasted *white*, and that surviving part is entertained into the belly of the *Chicken*; and being attracted by the small branches of the *Vena Porta*, is at last conveyed into the *Liver*.

It is therefore a clear case, that the *Chicken* newly hatched, (while it is yet weak and tender) is nourished by the *yolk*. And as while he remained within the *Egge*, he was partly fed by the *yolke*, and partly by the *whites*, but chiefly by the hospitality of the *whites*, which as they are in greater quantity, so are they sooner exhausted: so in like manner, when he is now hatched, (at which time all his aliment passeth through his *Liver*, and there receives a farther preparation) he is nourished partly by the *yolk* attracted from the *Guts*, and partly by the *Chyle*, which the several propagations of the *Meseraick Veines* suck into themselves; when there is in the *yolk* onely one propagation of the *Vena Porta* distributed into it, and a little onely of the *yolk* remaining. For *Nature*, as *Nurses*, being about to wean their *Infants* by degrees, gives them other meats sometimes, that so they may the better endure the decay of the *milk*: so the *Chicken* is trained by degrees, from meat of easier concoction, to harder (as from the *Yolk*, to the *Chyle*.)

Therefore what we see of the propagation of the *Veines* in the *Egge*, is done upon exceeding good grounds. For as soon as the *Chicken* begins first to be modelled, the *Veines* are then extended only in-

to



to the *Colliquamentum*; by which the blood being fed and grown, adjoyns the rest of the body to himself, to be brought up with him. Afterwards, the veins reach into the thinner *white*, from whence the Chicken receiveth his sustenance, (while he yet resembleth a *Gelly*, or *Mucilage*, and a *Maggot*) afterwards they spread into the thicker *White*, and anon into the *Yolk*, that by that also it may be entertained; and being as yet but tender, it is fed in part by the *yolk* (as by *milke*) hoarded up in the *abdomen*, and in part by food provided and prepared by the *Hen*, till it be able to seek abroad for nourishment convenient, and can digest it. So that through the whole series of Generation, Nature hath most prudently considered of various Aliment proportionable to the various abilities of the Digestive faculty of the future *Fetus*. For while it is yet feeble, she hath provided it milder diet, and solidier meats for its stronger capacity: and when it is now hearty enough, and can away with courser cates, it is served with commons answerable to it. And hereupon I conceive, that perfect eggs are not onely party-coloured, but also furnished with a double *White*.

And what we have found out by Experience, *De gen. an.* seems also to agree with *Aristotles* opinion, where *l.3.c.1.* he saith, That Part of it which is hotter, comes neerer the form designed to the institution of the members, but that which is earthier, yeelds matter to frame the body, and is more unlike. As in party-coloured eggs, the animal assumes the Rudiments of its generation from the *White*, (for the animals beginning is in the hot part) and its aliment from the *yolk*. Therefore in hotter animals, those two are reserved apart; namely, that from whence they take the beginning of their being, and that from

from whence they derive their aliment, and one of them is white, and the other yellow.

It appeares by what hath been said, that the *Chicken* (and the same thing shall afterwards be demonstrated of all conceptions) as he results, or is framed from the implanted principle, or soul of the *egge*, so he also obtaines his nourishment from the *Egge* too: wherefore he hath no need of a mother, as the *Plants* have of the *Earth*.

And it is no truer of him, that he is nourished by his mothers blood, or lives by her spirits; and so his own heart lies fallow and idle the while, then that he moves and perceives by his mothers organs, or is enlivened and takes growth from her soul. But the case is plain, and all men acknowledge, that the *Fetus* is fed by the *Umbilical Vessels*; and that the *Venal branches* disseminated into the *White* and *Yolk*, do hence derive sustenance, which they impart to the *Fetus*.

It is likewise clear, that when the *Chicken* is now hatched, or excluded, he is supplied with provisions, partly from the *Yolk*, and partly from the *Chyle*; and that they both pass into the *Liver* by the same *Vena Porta*, though by several branches of it.

It is also clear, (to speak by the way) that the *Chyle* which nourisheth all living creatures, is transported by the *Meseraick Veins* out of the *Guts*; and that there is no need to search out new wayes (namely the *Vena Lactea*) or to fantasie any other passage in grown bodies, besides what we finde in the *Egge* and *Chicken*. But as for the Inconveniences of that invention, we shall elsewhere discover them.

Lastly, by the constitution of the *Umbilical Vessels* in the *Egge*, (whereof we have declared some

to be *Veines*, and some *Arteries*) we may collect a *Circulation of the Blood*, (such as we have long since demonstrated in our Book, *de Motu Sanguinis in Animalibus*) and that for *vegetation*, *nutrition*, and *augmentation* sake : and therefore the *Umbilical Vessels* are disseminated into both the *Liquors*, that they may lead sustenance from them to the *fetus* ; and the *Arteries* are derived thither too, that by a plentiful affluence of *heat* they may concoct, dissolve, and render the aliment usefull to *nutrition*.

And hence it comes to pass, that wheresoever the *veines* (and under that name the *Arteries* also are here comprehended) do arrive to the substance of the *White* or *Yolk*, those parts seem to be dissolved, and put on a different look or appearance from the rest. For so soon as ever the *branches* of the *Veines* shoot forth, the superiour or exteriour part of the *White* (into which they are inserted) grows transparent, and melts into a *Colliquation* ; but the inferiour part remaining still thick, and compact, is confined to the *lower angle* of the *Egge*. So likewise there seem to be two parts (a *superiour* and an *inferiour*) of the *Yolk*, which do as much differ from one another, as *melted* from *unmelted wax* ; namely, that part which hath entertained *Veines* into it, from the other which is yet destitute.

Hence also we are acquainted with the *Exordium*, and first inherent principle of the *Egge*. For it is clear, that the *Cicatricula*, or *Speck*, is the principal particle of the *Egge*, to which all the rest are to be referred, and to which (if to any part before another) whatsoever it be, which makes the *Egge* *prolifical*, is to be imputed, as also the first onset towards the *generation* of the *Chicken*. And therefore (as we have shewed) presently after the *Incubation*



bation of the Hen, the *Cicatricula* is first of all dilated, enlarged, and makes a *Colliquation*; where in forthwith the blood moves, the *veines* are scattered, and the operations and effects of the native heat, do by the help of the formative Operatour, betray themselves; and by how much the deeper the small *Filaments* of these *veines* do take rooting, by so much the wider is the Empire of the *Vital faculty* advanced, and the Majesty of the *Vegetal Soul* revealed. For indeed every Effect is a cleare testimony of its Efficient.

In a word, upon the *Cicatricula* (wherein the first twy-light of native heat doth dawn) the whole Generation doth depend: Upon the *Heart*, the whole *Chicken*, and upon the *Umbilical Vessels*, all the *Membranes* involving the *Fetus* (which we call the *Secundine*) do rely. Wherefore we conclude, that the parts of the *Fetus* are in subordination one to the other, and do first borrow life from the *Heart*.

---

*Of the Order of parts in the Generation out of an Egge, according to Fabricius.*

EXERCITATION LIV.

IT being now resolved, which is to be esteemed the first part, namely the *Blood*, with its *Receptacles*, the *Heart*, *Veins*, and *Arteries*; it now follows, that we discover in what order all the parts of the Body are generated.

*Fabricius*

*Fabricius* (whose steps we trace in the Generation of the *Pullus*) ere he proceed to the order of the Parts, doth first recite the *actions* discovered in an *Esse*, and by whose assistance the Parts are formed; repeating also in order their *Faculties*: as if out of them the order also of the Generation of the Parts may be more clearly discovered. There are three actions, saith he, which appear first in an *Esse* upon which the *Hens* sits: the first is, the Generation of the *Chicken*; the second, its Growth; the third, its Nutrition. The first, that is, the Generation, is the proper action of the *Esse*; the second and third (namely accretion and nutrition) do for the greatest part come to a height out of the *es*; yet they are begun in the *es*, and perfected there too. Which actions, as they flow from three faculties, (the Generative, Augmentative, & Nutritive) so three Effects do ensue upon them: For from generation do all the parts of the *Chicken* result; from accretion and nutrition, Growth, and Increase: treating first of the Generation of the *Chicken*, we may discover, that by the help of Generation the parts of the *Chicken* (which were not before) are produced, and so the *Esse* is transformed into the body of the *Chicken*. Now while any part doth commigrate into another, it must needs pass through a commutation of its own proper essence; (for otherwise it must continue the same thing still) and also must be fashioned into a figure, scite, and magnitude convenient and consistent with its nature: and in these two things is the Procreation of a substance absolved, namely, Commutation, and Conformation; therefore the Immutative and Formative faculties, are the causes of these functions: Whereof the One hath produced each particular part of the body, just as we see it, out of the *Chalaza* of the *Esse*; the Other conferred the figure, scite, and composition convenient for all the several uses of it.

The first of these Faculties, which is the *Immutative* or *Alterative* faculty, is wholly natural, and doth act without any knowledge at all; and taking to it self, the hot, the cold, the moist, and the dry parts, it alters the whole substance of the *Chalaza* throughout, and by altering, it doth change it into the parts of the *Chicken*; that is to say, into *Flesh*, *Bones*, *Gristles*, *Ligaments*, *Veines*, *Arteries*, *Nerves*, and into all the other similar and simple parts of the *Animal*, or *Chicken*: and the *Cocks* seed doth by its proper ingenit heat and spirit, generate, create, and produce them out of the *Egge* (that is, the *Chalaza*) by *Alteration* and *Commuation*; imparting to every one of them its proper substance, and the proprieties belonging to that substance. The Other faculty which is called *Formative*, and which makes the similar parts dissimilar (bestowing their beauty upon them, from convenient figure, just dimension, proper scite, and competent number) being much more noble then the former, and full of incomparable wisdom, doth not act Naturally, but by *Election* or *Choice*, *Knowledge*, and *Understanding*. For truly this *Formative* faculty seems to be stored with most exact knowledge, and provision, both of the future *Action*, and also of the *Use* of every particular *Part*, and *Organ*. And thus of the first *Action* of the *Egge*, which is the generation of the *Chicken*, to whose celebration, both the seed of the *Cock*, as *Agent*, and *Fructifier*, and the *Chalaza*, is required, as the subject Matter. Next comes *Accretion*, which is done by *Nutrition*; whose Faculties are the *Attractive*, the *Retentive*, the *Digestive*, and *Expulsive* faculties: and lastly, the Faculty of *Apposition*, *Agglutination*, and *Assimilation*.

But as for this distribution of the *Actions*, I conceive it neither to be right, nor useful, nor pertinent in this place. Not *Right*; because those actions, which he seems to hold to be distinct, in their



their species, and time; namely that the parts should be first made similar, by the *Immutative faculty*; after that, formed, and made *Organical* by the formative; and then augmented by the augmentative) do no where appear so in the Generation of the Chicken; for the parts are all generated, distinguished, and augmented together. For though it be otherwise in the Generation of those Animals which are framed by a *Metamorphosis*; where all the parts are transformed, and lineated out of a *pre-existent matter*, which is large enough, and prepared before hand, (as when out of a Worme is made a Butterfly, and out of another Worme a Silk-Worme) yet in Generation by *Epigenesis*, the business is much otherwise; nor is the proceeding there, as it is in *Nutrition*, which is performed by the divers *actions* of diverse parts, joining their confederate forces and helps together: namely, where the Aliment is first attracted and retained; then concocted, then distributed, and at last agglutinated. Nor is the similar constitution produced by the *Alterative faculty*, without all kind of providence (as *Fabricius* would have it) And the *Organical*, by the *Formative*, which imployes knowledge and providence in her undertakings. For Generation and Accretion, are not made without Nutrition, nor Nutrition, or Augmentation, without Generation. For to Nourish, is to substitute into the place of that which is lost, as much, and such as is lost: namely, *Flesh*, or *Nerves*, into the roome of that *Flesh*, and those *Nerves*, which are impaired. And what is this other, then to make *Flesh*, or *Nerves*? So likewise *Accretion* is not without Generation: For all *Natural bodies*, are *Augmented*, by a new accession of those parts, of which they did consist

before: and that according to all *dimensions*: So that they at once do grow, are distinguished, and organized together,

And now, to *Generate a Chicken*, is nothing else, but to constitute all its parts, members and organs: which though they are made in order, and some are *post-genit*, or *later production*: then others (as the *lesse principal parts*, compared with the *more principal*) yet while the organs themselves are distinguished, their generation doth not proceed in such order, that the *similar parts* must be first made, and the *organical* be afterwards compounded out of them: as if the *compounding parts* were first to exist, and then the *Composition* to be raised out of them. For though the Head of the Chicken, and the rest of its Trunk, or corporature (being first of a similar constitution) do resemble a *Mucus*, or a soft *glewey substance*: out of which afterwards all the parts are framed in their order: yet by the same operation, and the same Operation, they are together made and augmented: and as that substance resembling *glew* doth grow, so are the parts distinguished. Namely, they are Generated, Altered, and formed at once: they are at once similar and dissimilar: and from a small similar, is a great organ made. In the same manner as out of the straw, the spike, reeds, and graines do arise, and are distinguished: and as the Trees, when they shoot forth their young buds, do out of them, expand and produce flowers, leaves, fruit, and at last, seed.

And this we have learnt out of those things which are conspicuous in an egge, by diligent observation of them. For by the effects, the actions, or operations are perceived; by the operations, the faculties, and by them, the Operatour

or Efficient. Wherefore in the Generation of the Chicken, the actions or faculties of the *Generant* (which *Fabricius* recites; namely, the *Immutative* and *Formative*) do not differ *Specie*, nor yet *secundum prius & posterius*, but (as *Aristotle* useth to speak) *ipso esse*, and *ratione solum*: not as it befalls the actions of the *nutritive faculty*, after the birth, (to wit, Attraction, Concoction, Distribution, and Apposition) which performe their duties in several places, and at several times. For otherwise the Generative faculty her self, should be enforced also to use diverse instruments to perform her several operations.

Wherefore *Fabricius* affirms amisse, that the *Immutative Faculty* doth operate by the qualities of the *Elements*, namely, Heat, Cold, Moisture, and Dryness: (as being its instruments) but that the *formative* works without them, and after a more divine manner: as if (forsooth) she did finish her task, with meditation, choise, and providence. For had he looked deeper into the thing, he would have seen, that the *Formative*, as well as the *Alterative faculty* makes use of hot, cold, moist, and dry, (as her instruments) & would have deprehended as much divinity and skill, in Nutrition and Immutation, as in the operations of the *Formative faculty* her self. For *nature* hath instituted all those faculties for some end; and doth every where work with providence, and understanding. Whatsoever it is which makes the seed of Plants fruitful, and doth exercise a plastick virtue in it: and that which in an *egge* executes the office of a most skilful Workeman, doth produce and build the parts, and by Calefying, Refrigerating, Moistning, Drying, Concocting, Condensing, Hardning, Softning, Dissolving, both Fashion, and



Augment them; doth also distinguish them, by Figure, Scite, Constitution, Temperature, Number, and Order: disposing and compleating all things, with like providence, election, and understanding, (no lesse in the alteration, then nutrition, augmentation, and formation of them.)

I say the Concocting, and Immutative; the Nutritive, and Augmenting faculties; (which *Fabricius* would have to busie themselves onely about Hot, Cold, Moist, and Dry, without all knowledge) do operate with as much artifice, and as much to a designed end, as the Formative faculty: which he affirms, to possess the knowledge and fore-sight of the future action, and use of every particular part, and Organ.

As the Art of Physick, the Bakers and the Cooks slight (which set on work, the hot, cold, moist, and dry, and such like natural Instruments) doe no less require the exercise of reason, then Mechanical Trades, which either work with their own hand, (as the Smith, the Statuaries, and the Potters) or other artificial instruments. But as in the greater world, we say, *Jovis omnia plena*, All things are full of the Deity, so also in the little edifice of a Chicken, and all its actions and operations, *Dignus Dei*, the Finger of God, or the God of Nature, doth reveal himself.

Therefore if it be lawful for us to judge of the faculties by the operations; the Vegetal Operations do rather seem to be executed by Art, Election, and Providence; then the very actions of the Rational soul, and the Mind, though in a most perfect man, the top and pinnacle of whose Knowledge and Understanding, consists chiefly (according to *Apollos* verdic) in this, *ut noscat se ipsum*, that he know himself. A more sublime, and  
diviner

Ex.LIV. according to Fabricius.

311

diviner Artificer therefore (then man is) seems to make and preserve man : and a nobler Agent then a Cock, doth produce a Chicken out of the Egge. For we acknowledge our Omnipotent God, and most high Creator, to be every where present in the structure of all creatures living ; and to point himself out by his Workes ; whose Instruments the Cock and Hen are in the Generation of the Chicken. For it is most apparent, that in the Generation of the Chicken out of the egge, all things are set up and formed, with a most singular providence, divine wisdom, and an admirable, and Incomprehensible Artifice.

Nor can these Attributes appertain to any, but to the Omnipotent Maker of all things, under what name soever we cloud and veil him : whether it be, *Mens divina*, the divine Mind, with Aristotle, or *Anima mundi*, the soul of the Universe, with Plato ; or with others, *Natura Naturans*, Nature of Nature her self ; or else *Saturnus*, or *Jupiter*, with the Heathen ; or rather, as befits us, the *Creatour*, and *Father of all things in Heaven, and Earth* : upon whom all *Animals*, and their births depend : and at whose Beck, or *Mandat*, all things are created, and begotten.

Moreover (as I have observed) this distribution of the *Actions*, or *faculties* of the *Soul* (which Fabricius doth premise to the order of Generation of the parts) as I apprehend it to be faulty, so also I conceive it to be unprofitable and inconvenient, or impertinent to our business. For we doe not attain to the knowledge of the *Effect*, by the knowledge of the actions or faculties, but rather on the contrary, from the *Effects* we ascend to the *Faculties* ; for the effects or workes are *notiora nobis*, more known unto us, then the faculties

from whence they spring : and the parts ( which we see made already ) are more intelligible in Generation, then the actions which framed them.

Nor do those things which are to be considered and determined in the general observation of all *Animals*, fall properly within the compass of the particular generation of the *Chicken* out of the *Egge*. But of them more hereafter.

In the mean time, we shall proceed to the Order of the Generation of the parts. It remains, saith *Fabricius*, that we consider and contemplate in what Order, that is, which part is made first, and which after in the *Egge*. In prosecution whereof there are two foundations to be laid : one in respect of the body : the other in relation to the incorporeal substance, as, the Nature or Soul. I call that (saith he) the Corporeal foundation, which depends upon, and flows from the Nature of the body : and whereof an instance is easily deduced from things made by art : For, as every edifice doth first require a foundation, upon which the whole frame is to be laid and supported : whence the walls are set up, which do sustaine the Floors and Roofe : and then the Household-stuff, and other furniture are introduced ; so doth nature proceed in the Fabrick of *Animals*. For first she laies the Bones as the foundation, that all the parts of the Body may grow to, hang, upon, and be established by them. Which bones are first made under another capacity. For since Bones take their first rise from a most soft and membranous substance, and doe afterwards attaine their induration ; therefore much time must be allotted to the Generation of the Bones, that so they may become the hardest parts ; and hereupon they are begotten first. And for this reason *Galen* did not compare the structure of an *Animal* to every kind of building, but chiefly to that of a Ship. For, saith he, as the foundation



*dation and original of the Ship is the Keel, from which the sides, or planks imbowed, and placed at a distance one from the other (like a Hurdle) are set up on both sides, that so the whole frame of the Ship may be afterwards finished out of the Keel, as a convenient foundation; So in the fabrick of an Animal, Nature first stretcheth out the Chine bone, with the Ribbes drawn round it, as the Keel, and congruous principle, whereon she foundeth and finisheth the whole Pile.*

But Experience doth abundantly confute this phantasie: for it is evident, that the *Bones* are rather made last of all. For the *Bones* of the *Limbs*, the *Skull* and *Teeth*, are not made before the *Brain*, the *Muscles*, and *fleshey parts*; but even after the nativity, in the tender, and (otherwise) perfect *fetus*, they are onely *Gristles*, and *Membranes*, and afterwards in tract of time arrive to the *solidity* of *Bones*, as doth appear by *Infants Skulls*, and the *Ribbes* and *Joints* of *Embryo's*.

And though it be true, that the first platforme of the body appears like a Bent or incurved Keel, yet is it of a soft, mucous, and glutinous consistence, no way resembling either the *Nature*, *Constitution*, or *Office* of a *Bone*. As also the small *Globous bodies* which are its appendixes (designed for the parts of the *Head*) have no *solidity* at all in them, but are onely *Vesicles* stuffed with clear water, which are afterward transformed into the *Braine*, *After-braine*, and *Eyes*; and are at last fenced with the *Skull*, namely, after the *Bill*, and *Clawes* have attained *solidity*, and *obduration*.

Wherefore this Contemplation of *Fabricius* is a sleepy, and injurious one; He not considering what really is done by *nature* in the order of *Generation*, but rather what nature according to his phan-

314 *Of the Order of the parts in an Egge, Ex.LIV.*

pag. 44.

phantie, ought to have done ; as if Nature did imitate *Art*, and *Art* were not rather *Natures Ape*. Which coming into his head, himself afterwards saith, *Satius fuerit dicere, &c.* It is a more dilibegrate assertion to say, that *Art* was *Natures Scholar*, and wrought by her Copy: because as *Galen* every where pronounceth, *Nature* is of more *Antiquity*, and wiser in her productions then *Art*.

And though the bones are the foundation of the whole body, without which it can nor stand nor move : yet it is sufficient for them, if they are made together with those parts, which do rely upon them. For where the things which are to be upheld are not in being, the *Props* are provided to no purpose. But nature doth nothing rashly ; nor constitutes parts, before there is use of them. But all Animals attaine their parts, so soon as action and usefulness is required of them. And therefore this first foundation of *Fabricius* his laying, countenanced by his own observations in the *Egge*, and *Galens simile*, is clean demolished.

He seems to come neerer the Mark, when hee saith, The other foundation of producing the parts in order, is desumed from Nature, that is, the soul, which is Queen Regent of the animal body. For since there are two degrees of the soul, the *Vegetal* and *Sensitive*; and the *Vegetal* is, tempore & natura prior, first both in time and nature, because it is common to the very Plants ; doubtless the Instruments subservient to the *Vegetal*, are first to be made and fitted, before those that attend the sensitive and motive faculties : especially the more principal ones, and where the Queen keeps Court. Now these are chiefly two, the *Liver*, and the *Heart* : the *Liver* as the throne of the *Vegetal* or *Nutritive* : and the *Heart* as that Minister of State,

who,

who by his heat and warmth, doth enliven and compleat both the Vegetal, and other Faculties, and therefore holds a strong league and confederacy with the Vegetal. Wherefore if after three dayes Incubation, you discern in that part of the egge where the Chicken is bred, the heart panting, (as Aristotle also testifieth) muse not at it, but conclude that the heart relates to the vegetal Faculty, and is therefore the first begotten. Now it is also consonant to Reason, that the Liver also should be Twinne to the Heart, and born with it, but doth not appear, because he wants a palpitation, which the Heart hath. For even Aristotle himself saith, That the Liver and the Heart are constituted in the body upon like grounds; so that if there be a Heart, there must be a Liver too. If therefore the Liver and Heart are first begotten, it also followes, that the other Organs that are menial servants relating to these two, should be begotten together with them; as, the Lungs for the Heart; and for the Liver, almost all the parts which are contained in the Lower Belly.

But all this is very wide from that order and progress which we see in the Egge. Nor is it true, that the Liver is born together with the Heart: nor will that shift serve his turn, where he pretends, *Latere Jecur, quia non palpitat*, that the Liver lyeth concealed, because it is not exposed by palpitation. For the Eyes, the Vena Cava, and the Carina, the Keel, are discerned even from the very first, yet have they no palpitation. What impediment then to barre the Liver and Lungs (if they are then in being) from being seen? Nay, he himself, in his Figure or Table, representing the fourth day, hath described a small Point in the midst, and yet he hath not signified any palpitation belonging to it; nor did he own it for the Heart, but supposed it to be the first rudiment of the body: wherefore



fore he speaks onely out of conjecture, and pre-entertained opinion, when he proclaims the Principality of the Liver: as other men have also done, (namely, *Aldrovandus*, and *Parisanus*) who casually lighting upon two Points, and could not discover a Pulse in both, at one and the same time, conceived the one to be the Heart, and the other the Liver. As if the Liver had any pulse at all; but those two Points are the two *Vesiculae Pul-santes*, returning answer to each other in alternate contractions; as hath been noted in our History.

Wherefore, either *Fabricius* is deceived, or doth deceive, where he saith, Presently in the first progress of generation, the Liver, Heart, Veines, Arteries, Lungs, and all the parts contained in the lower belly; likewise the Keel, that is, the Head, with the Eyes, and the whole Spine and Chest, are born and framed. For the Heart, Veins, and Arteries, are perfectly distinguished, for some time, before the Keel; and the Carina, or Keel, before the Eyes; and the Eyes, the Bill, and Sides, before the Members contained in the lower belly: and also the Stomack, and Guts, before the Liver, or Lungs, are discerned. And that order is observed in generation, which we shall presently describe.

He is likewise deceived, when he decrees the Vegetal part to have a being both in time and nature before the sensitive and the motive. For that which is first in Nature, is for the most part after, in the order of Generation. In time, indeed, the Vegetal part is before, because the sensitive soule cannot be without it. For it cannot actually exist in the body without Organs, it being *Actus corporis Organici*, the Act of the Organical body: but the sensitive and motive Organs, are the workmanship of the vegetative; and the sensitive soul

soul (before it actually exist) is *tanquam Trigonus in Tetragono*, like a Triangle in a Quadrangle. But Nature first intends that which is most principal and noble; and therefore the *Vegetal faculty* is after in the order of Nature, as being subservient to the *sensitive*, and *motive Faculty*.

Of the Order of Parts in Generation, according to Aristotle.

EXER. LV.

THAT which relates to the order of Generation, according to Aristotle, is thus: When the Con- De gen.an.  
ception is ordained, it proceeds as Seeds do. For Seeds <sup>l. 2. c. 4.</sup> also have a first Principle in themselves; which being first contained in *potentiâ*, when by and by it is severed, it sends forth a bud, and a root, whereby it attracts aliment; for it requires growth. So in some sort in a conception, where the parts are all in *potentiâ*, the Principle is chiefly active.

This Principle in an Egge (analogous to the blossom of Plants) we with Fabricius call *Macula*, a Speck, or *Cicatricula*, a small Cicatrice: which we have avouched to be the principal particle, in which all the other parts are in *potentiâ*, & whence afterwards they arise in their order. For in it is contained that thing (be it what it will) which renders the Egge *prolific*; and there is the first effect of the *vegetal beat*, and operation of the *Forming faculty* first discovered.

*Macula isthæc*, that Speck (as hath been shewed) is presently dilated after incubation, and divided into

into Circles; in whose Center a small white Point (like the Cicatricula, in the ball of the Eye) doth display it self: where by and by the *Punctum rubrum*, the Red point, is discovered panting, with the capillary branches of Veines containing blood; and that presently, so soon as ever the *Colliquamentum* by us mentioned, is framed of that *Macula*.

*Ibid.*

Wherefore Aristotle proceeds; The Heart is first actually discerned; and that not onely discoverable to sense, but according to reason. For since that which is begotten is now disjoyned from both parents, it ought to demean, govern, and dispose of it self, as a Son set free by his Father, and seated apart. And therefore a Principle, and that an Intrinsicall one, must needs be had, by which afterwards the order of the Parts is to be prescribed, and all things relating to the complement of the Animal, managed, and disposed. For if it were Extrinsicall at any time, and afterwards began to enter in, you would not only be in suspense, and question when it went in, but conclude, that since each part is distinguished, it was necessary that part should subsist, out of which both growth and motion is conferred upon the other parts. In another place he saith, The first Principle is a part of the whole, and not any separate thing, which is contained apart from it. For, saith he, when the Animal is now generated, is that Principle corrupted, or doth it remain? Now nothing seems to be in, which is not a part of the whole, be it Plant, or Animal. And that it should be corrupted, when it hath been at the expence of making all, or some of the parts, is very absurd; for what shall make the remainder? Wherefore (he proceeds) who side with Democritus, saying, That the exterior parts of the Animal are first made, and then the interior: as if they were to build a wooden or stony Animal, do not say well; for such a creature as that hath no Principle in it self. But all Animals



animals have, and contain one within them. Whereupon the Heart is first seen in all Animals, in which there is blood; for that is the Principle of the similar, and dissimilar parts. Now that thing which requires Aliment, ought already to have received that principle of an Animal, and constituted Fœtus.

Which words do plainly declare, that Aristotle did conclude of an Order in the Generation of Animals, and of a Principal part, namely, the Heart, which (like a Son at liberty) is the first animate, and primogenit part of the Animal, contained, and abiding in it: whence not onely the method of the parts is set down, but the Animal it self, preserved, and relies upon it, receiving continual life and sustenance; and that thence, whatsoever is necessary to the perfection of the Animal, is derived. For, (as Seneca saith) in the Seed is the whole Nat. quest. accompt of the future Man comprehended. And the Infant yet unborn hath a Standard and Commission for a Beard, and a Gray-head. For the dimension of his body, and ensuing yeares, are already deciphered in a small, mysterious character. l. 3. c. 19.

Now whether the Heart be the Primigenial part, or no, we have determined above. To wit, if Aristotles speech be understood of that part, which (in the Anatomy of Living creatures) is seen by the eye to be before the rest, (that is, of the Punctum saliens, together with the Veines streaming with blood) we cheerfully embrace his judgement. For we believe, that the Blood, together with the Vessels, and Instruments; namely, the Umbilical Veines, (by which, as by Roots, the Nutriment is attracted) and Vesicule pulsantes (to whom it is distributed for the life and growth of the parts) is constituted before any other. For (as Aristotle saith) the matter by which any thing is augmented, and

320 *Of the Order of parts in Generation, Ex. LV.*

and out of which it is first made, is one and the same.

But they are much abused, who conceive, that the diverse parts of the Body are sustained with a diverse aliment. As though Nutrition were nothing but a bare choice, and attraction of aliment: and that no concoction, assimilation, apposition, and transmutation, were required of the particular parts which are to be nourished: which was the opinion of *Anaxagoras* of old.

*Principium Rerum qui dixit Homæomeriam ;  
Ossa videlicet è paucillis atque minutis  
Ossibus ; sic & de paucillis atque minutis  
Visceribus, Viscus gigni : sanguenque creari,  
Sanguinis inter se multis coeuntibu' guttis.*

Who said, that Things from their Like-  
parts begin ;  
That Bones from less, and fewer Bones  
do spring ;  
And Intrals rise from Intrals , Blood  
from Blood,  
Where the Confederate drops make up  
the Flood.

In the place before cited. But *Aristotle* most truly saith : Distinction of parts is not, as some suppose, upon that ground, that Like is of its own nature tending to its Like: for besides many other difficulties which beset that opinion, it will follow, that every similar part must be ordained apart by it self: as for instance ; Bones by themselves, Nerves, and Flesh by themselves, in case that opinion be admitted. But, indeed, the Nutriment of all parts is common and similar, as the Yolk in the Egge ; and not heterogeneous, and compounded of diverse parts. And therefore what we have said concerning

ing the *matter* out of which the Parts are made : we pronounce the same of the *matter* out of which they are augmented ; namely, that the parts do assume their Nourishment out of that *matter* , in which all the Parts are *in potentiâ*, but none *âctû*.

As out of the same *Showre* all kinds of *Plants* take growth, because that moisture, which was before like *in potentiâ* to them all, is now made like them *âctû*, being transformed into their *substance*; And is also bitter in *Rue*, sharp in the *Mustard*, and sweet in *Licorise* ; and so in the rest.

He goes on, to explain what Parts are generated before others ; and that with a reason not much unlike *Fabricius* his *Fundamentum secundum*, his second ground or foundation, saying, *Id cuius causâ, & quod ejus causâ, differunt ; & alterum generatione, alterum essentiâ prius est ;* namely, the *End* is first in *Nature* and *Essence*, in respect of that thing which is made for the *Ends* sake ; but That which is made for the *Ends* sake, must needs be first in *Generation*. And by that Argument *Fabricius* rightly infers, that those Parts which are subservient to the *Vegetative soul*, are all made before those which are *instrumental* to the *sensative*, because that is *subordinate* to this.

After this, he subjoines the differences of such things as are made for any *End* ; namely, that some things are instituted for some *End* by *nature*, because the *End* doth ensue upon them : but some, because they are *Instruments* which the *End* makes use of : and those he calls *Genitalia*, but these, *Instrumentalia*. For the *End*, saith he, in some things is *after*, and in some, *before* those things which are their *causes*. For the *Generant* himself, and that which he employes in *Generation*, must needs exist before that which is *generated* by them.



And therefore the Parts subservient to the *Vegetative soul*, are before those which are retained by *Sense*, and *Motion*. But the Parts dedicated to *Motion* and the *Senses*, are after the *sensitive* and *motive Faculties*; as being *instrumental*, and made use of by the *sensitive* and *motive Faculty*. For by *Natures Law*, no Parts or Instruments are made and constituted, before there be *employment* for them, and a *faculty* be ready at hand, to set them to work. So neither the *Eye*, nor the *Instruments* of *Motion* are set up, till the *Brain* is built, or the *faculty* be already provided, which is to *See*, or *Move*.

In like manner, because the *Vesiculæ pulsantes* do (as Instruments) minister to the *motion* of the *Blood*; and likewise the whole Frame and Fabrick of the Heart (as we have evidenced in our Book *de Motu Sanguinis*) is *Instrumental*; (namely, that the *Blood* may be continually hurried round the *Body* in a *Circle*) the *Blood* seems to have a being both in *Order of Nature* and *Generation* before the *Heart*; which he employes as an Instrument, having begotten it also, and doth persist to *nourish*, and convey *heat*, *spirits*, & *life* unto it by the *Coronal Artery*.

But how this General Rule of *Aristotle* concerning the *præ-ordering* of the Parts, doth appear to be true by *Anatomical Observation*, we shall declare hereafter. In the mean time, we will enquire, after what manner he himself doth sufficiently deduce the *Causes* of *Priority*, as I may so say, in *Generation*, according to this Rule.

After the Principle (namely the Heart) are the *Interiour parts* begotten, before the *exteriour*; the *superiour*, before the *inferiour*: for the *inferiour* are for the *superiours* sakes, as being their instrument: after the pattern observed in *Plants*, which shoot forth their *Roots*, before their *Branches*.

But

But Nature doth not use that method in Generation; nor is the instance alwayes true; for in *Beanes, Ciches*, and other *Pulse*, also in *Acornes* or *Mast*, and *Corne*, it is apparent that at the same time, the *Stalk* shootes upward from the same *Bud*, and the *Roots* downward. Likewise *Onions*, and other *bulbous* plants, do germinate upwards before they fix downwards.

But he adjoines another cause of this order; to wit, *Nature makes nothing superfluous, nor nothing in vaine; whence it appears, that nothing is made by her, either before or after another, otherwise then need requires.* Namely, those parts are first generated, whose uses and functions are first required: some also are sooner begun, because they call for more time to perfect them, that so they may be ready for the birth, together with others that are forwarder then they. As the *Cook* being to provide a feast, where some provisions (by reason of their solidity) aske a slower fire, and longer time to prepare them, he laies them down to the fire first: but to those that are sooner dispatched, and are dressed with a gentler heat, he applyeth himselfe last: and such also as are to be served up in the first course, he makes ready first, but those in the second, last. So likewise nature, in the generation of Animals, is late ere she delineate the moist, soft, and fleshey parts, (as being quickly cooked, and reduced into shape) but for the hard and more solid (as the *bones*) because they exact a large Evaporation, and Exsiccation, and their matter continues long indigested, to them she addresseth her selfe first of all. For in the *Braine* also, saith he, the same falls out, namely, that at first it is very moist, and great in quantity: but anon, the humidity evaporating, and being concocted, it growes

more solid, and so the quantity of the Head, and Eyes, do abate. In the beginning therefore, the Head seems very bigge (in comparison of all the rest of the body, which it much exceeds in bulke) by reason of the Braine: and the eyes very large, by reason of the humour contained in them. But yet the eyes are perfected last; because even the Braine it selfe is long ere it grow to a consistence. For it is long ere it get the mastery, and drein the water, and especially in a Man. For the Sinciput is last confirmed of all the Bones; for that bone is yet soft, even when the Child is born into the World.

He also proceeds to another reason; namely, that the parts are framed of different materials. The more noble parts, (saith he) and those that participate the worthiest principles, are constituted of the concocted, purest, and chiefest aliment: the other necessary parts, made for their sakes, are fashioned out of the baser matter, the reliques, and dregs. For Nature, like a prudent Master of a Family, loseth nothing, out of which he can make any advantage, but so manages the matter in his house, that his Children may fare best, his Servants harder then they, and the scraps or refuse thrown to the Dogs. As therefore, Incremento jam addito, mens advena facit hæc, that is, (as I interpret it) a prudent man grown to years of discretion, disposes thus of his Charge; So in the framing of things, Nature (by an inbred wisdom and prudence) formes the flesh, and substance of the instruments of sense, out of the most refined matter, but the Bones, Nerves, Hair, Nails, Hoofes, and the like, out of the Dregs, (that is the refuse, remainders, or fragments) And therefore these are made last, when nature hath now good store of course materials. And after this, he distinguisheth of two sorts of Aliment; one of Nutrition, the other of Aug-



mentation. That of Nutrition, saith he, doth supply a being to the whole, and all the parts, that of augmentation procureth an accession to the magnitude.

According to what we finde in the *Egge*; where the White (as the more refined *Aliment*) relates to the first Nutrition of the Chicken; the Yolk to its augmentation. And the thinner White (as hath been shewed) conduceth to the formation of the First, and nobler Parts; but the Courser, and the Yolk, to the augmentation of the Nobler, and formation of the more Ignoble. For, he saith, the Nerves are framed as the Bones, out of the seminal and nutritive excrement. But the Nailes, Haire, Spurres, and all like these, are formed out of augmentative, and adventitious meats; which the Foetus both receives from the Mother, and also doth provide of it selfe. And after this he at last gives the reason, why Man (since other *Animals* are provided with their Garments, and Weapons at *Natures* price) should be borne naked, and unarmed; namely, that those kind of parts are constituted of the excrementitious parts, and reliques, but the materials of *Men* are purer, in which there is very litle terrene, or crude excrement to be found.

And thus far have we made use of *Aristotle*, concerning the Order of Generation: where all seems to be bottomed upon one foundation; namely, *Natures* Perfection; which in all her Workmanship, hath nothing short, nor nothing superfluous, but always disposeth matters for the best. And therefore no part had been precedent or subsequent to one another, if it had been more advantageous to have formed them altogether; which is to be understood of Her, as often as she acts freely, and by choice. For sometimes she acts other-

wife, being as it were under constraint, and put beside her purpose; which happens, when either by defect of matter, or superfluity thereof, or by the default of her instruments, or some outward impediments, she is hindered in her work, and frustrated of her aime, or end. And hence it comes to pass sometimes, that the *final parts* are generated before the *Instrumental*: I call those *final parts*, which employ others, (as their instruments.)

And because some parts are Genital parts, which Nature sets to work about the Generation of other parts, or else to remove some Obstructions in her proceedings, which in case they continue, the Generation may be retarded: and others are under another capacity: therefore it comes to pass, that according to the disposition of the matter, and other requisites, the parts are diversly made some after other, and some of them are in hand before, but are not finished till afterwards: some are begun and finished before others are begun, and others are as soon begun as their fellows, but finished after them. And therefore in the generation of some *Animals*, the same order is not always observed, but it is much different and various; and in some no order at all: but all the parts are begun, and finished at a heat: namely by a *Metamorphosis*, as we shewed. And lastly, hence it happens that the *Primogenit part* is such, that in it is concluded both the *Beginning*, and the *End*; as well that for whose sake all are made (namely the *soul*) as also that which is its cause in chief, and Genital part. The Heart therefore (or, according to my perswasion, the *Blood*) is the first throne of the *Soul*; the fountain of life; the Vestal fire; the Genital warmth; and the very *Calidum Innatum*; the first Efficient of all his ministering

string parts, having atcheived the soul for his end, which commands them all as her leige-people. The Heart I say, (as *Aristotle* will have it) is he, for whose sake the whole Fabrick and Family of the parts are provided, and who also is the Fountain, and Father of them all.

Of the Order of Parts in Generation,  
as it appears by our Observations.

EXER. LVI.

THat we may at last propose our own opinion of the Order of Parts, as we have collected it out of several Observations of our own; we intend to distinguish the whole work of Generation (in all *Animals* whatsoever) into two Fabricks.

Whereof the first is that of the Egge; namely, of the Conception, and Seed, or of that, whatsoever it is, which (in *Spontaneous productions*) answereth in proportion to Seed; whether we understand it under the notion of *Calidum nativum caeleste in humido primigenio*, the Innate celestial substance, in the Primigenial moist, with *Fernelius*, or with *Aristotle*, of *Calor Vitalis in humore comprehensus*, the vital heat concluded in moisture. For the Conception in Viviparous Animals (as we have said) is answerable to the Seed and Fruit of Plants; as also the Egge, in Oviparous; in Spontaneous productions, the Worme, or some *Bulla* teeming by the Vital heat of the contained moisture. In all which the same thing is



comprehended, which may truly call them Seeds; namely, out of which, and by which (as the matter, and Efficient, and pre-existent Organ) every *Animal* is first made and borne.

The Other Fabrick is of the *Fætus*, born out of the Seed, or Conception. For the Matter, and the Final, and Efficient causes, and the Instruments necessary to the worke, must first be, before any part of the Production can begin.

The Fabrick of the Egge we have already seen: but that of the *Fætus* (so far as we could discover out of dissections) is perfected (especially in the more perfect race of *Animals*, and such as have *blood*) chiefly by four degrees, or proceßions: which according to the several times of generation, we shall reduce into as many Orders; demonstrating withall that the same thing which is discerned in the Egge, is alike in every conception and seed.

The First progress is of the Primogenit, and Genital part, namely of the *blood*, with its receptacles, or if you will have it so, of the Heart and his Veins.

Now this part is first begotten, chiefly for two reasons, both because it is the principal part, which makes use of all the rest, as its Instruments; and for whose sake the other parts seem to be produced: as also, because it is the Chiefe Genital part, the Fountain and Author of the rest; The part in which is concluded both the *Beginning* and *End* of Generation; the same being *Pater & Rex*, Parent, and Sovereign.

In the Generation of these Parts, (which is determined in the Egge the Fourth day) though I could not observe any Order; because all its particles (*Blood, Veins, and Vesicula pulsans*) appear  
at

at once; yet I believe (as I said) that the *blood* is in it, before the *Pulse*: and that it also in *Natures Law*, is before it *receptacles*, the *Veins*: for the substance and structure of the Heart (namely the one with its *Ventricles* and *Auricles*) as it is generated long after with the other *Intrals*, so ought it to be registered in their *Classis*, which is the *Third*.

In this structure, the *veines* are conspicuous before the *Arteries*, at least, as farre as we could observe.

The *Second Journal*, which sets out after the fourth day, discovers a certain *Concrementum*, or coagulated substance, which I call *Vermiculum*, seu *Galbam*, the little *Worm*, or *Magot*; (for it seems to enjoy the life and obscure motion of a *Galba*) and this, as it congeals into a gelly, is divided into two parts; whereof the upper and the larger is conglobated, and distinguished into three *Vesicles*; namely, that of the *Brain*, *After-brain*, and one of the *Eyes*: but the lesser, *carinam referens*, resembling the *Keel* of a *Ship*, is superinduced upon the *Vena Cava*, and is extended according to its length.

In the structure of the *Head*, the *Eyes* are first discerned, and anon a white spot starts up for the *Bill*, and the *films* drying about, it becomes protected by a *membrane*.

At this time also the *adumbration*, or rough draft of the rest of the *Body* seems to succeed; where first upon the *Carina* the *sides* or *plancks*, as it were, of a *Boat* seem to arise; being at first of a similar consistence, but afterwards by most white streaks they are signified to be the lines of the *Ribs*. After this, the *members* of *Motion*, namely, the *Wings* and *Legs* do appear: and at last the *Keel*, and *Limbs* born by a kinde of *Superfatation*, are distin-

distinguished into *Muscles*, *Bones*, and *Joints*.

Those two first mishapen materials of the *Head* and *Body*; do together appear, and are together distinguished: but afterwards, when they tend towards growth and perfection, the *body* gets the start, and is much sooner grown and shaped; so that the *Head* which did at first out-strip the whole *body* beside, in bulk and magnitude, is now very much short of it. And this is likewise natural to humane productions.

The like Disparity is between the *Body* it selfe & the *Limbs*; for in an *Infant* (from that time that the *Embryo* exceeds not the length of the Nail of the little *Finger*, till he be encreased to the stature of a *Frog*, or a *Mouse*) his *Arms* are so short, that if you stretch out his *fingers* over his *breast*, to their farthest extent, they will not be able to touch one another; and his *thighs* are so short, that being reflected upon his *Abdomen*, they will hardly reach to his *Navel*.

Nay, in Children lately born, the proportion of the bulk of the *Body* is a pretty deal larger then that of the *Limbs*, untill they are able to stand, and go. And therefore *Infants* are first *Dwarfs*, and crawl like *beasts*, & attempt to move on, though upon all four: but go upright they cannot, till the prolixity of their *Legs* and *Thighs* exceed the longitude of the rest of the *Body*. And hence is it, that their first venture to foot it, represents them a prone kinde of *Cartell*, which can scarce exalt themselves to the erection of a *Cock*.

And therefore amongst grown persons, the long *stimmie Fellows*, (whose *Thighs*, but especially their *Shanks*, are longer then ordinary) can stand, walk, run, or vault longer, and at more ease, then *square*, and well trussed men.



In this second Process, several actions of the Formative faculty pursuing one another, may be observed; (as in the Automata, or engines that go of themselves; where the fore-going wheel sets his follower upon motion too) and all the parts spring from the same gelly, and similar substance. Not as some Natural Philosophers expound it, who say, that *De gen. an. l. 2. c. 4.* Like is hurried unto its like: but we must say, That the parts are moved not by changing their station, but remaining where they were, and altering in softness, hardness, complexion, and those other differences of similar parts; being now made those things Actu, which they were before in Potentiâ: that is, the Limbs, the Spine, and the rest of the Body, are altogether formed and encreased, are together described, and complexioned: also the Bones, Flesh, Nerves, and Gristles, which were all similar at first in the same members, and of one kinde of substance, in progress of Time are plainly distinct; and being conjoined, make up Organical Parts, by whose mutual connexion and continuity the whole body is compiled. So in the Head, the membrane growing every where light, the Brain arrives to its consistence, the Eyes are polished out of a fluid instable moisture.

Nature doth feed and enlarge all the Parts, out of the self same Nutriment, whereof the first did frame them, (not as many will have it, out of a diverse one, and such as is like to every particle) namely, by augmenting her same gelly, or worm: and like a potter, first she divides her materials, and she allots to the Trunk, the Head, and the Limbs, every one their share or cantlin: as Painters do, who first draw the Lineaments, and then lay on the Colours: and as a Ship-Carpenter, first layes the Keel for a foundation, and then sets up the Ribs, and Breast-bone, or Deck: and as he builds a boat, so doth

doth *Nature* the Trunk of the Body, and hasp on the Joints. And in her work, she begins all the *similary* part out of the same Primitive gelly, or glutinous mass, (namely, the *Bones, Gristles, Flesh, Nerves, &c.*) For at first there appears nothing of the *Bones*, but a kinde of *filaments*, or threddy fibres; which afterwards become *nervous*, anon *Gristles*, after that, like *thorns*, and at last down right *Bones*. So likewise the thicker Membrane investing the *Brain*, proceeds first to be *gristly*, and afterwards into a *Skull*: while the thin Membrane doth improve into a *Coat*, or *Pericranium*, and *Flesh*. And in the same Order the *Flesh*, and *Nerves*; out of a yeilding gelly, do concoct and strengthen, into *Muscles, Tendons, and Ligaments*: The *braine*, and *after-braine*, from a thin *Water*, coagulate into a *Callous Curd*; for the *braine* of *Infants*, before the *bones* of the *Sinciput* are confirmed, appears soft and fluid, and hath no more coherence, then *coagulated Milk*.

The third Process is of the *Intrals*; whose generation is discovered in the *Chicken*, after the delineation of the body; (namely about the sixth or seventh day) and neer upon the same time, they all appear, that is, the *Liver, Lungs, Kidnies*, the *Cone* of the *Heart* and its *ventricles*, and also the *Guts*. But their first original is from the *Veines*, and are bred growing to them, (like *Wens* to the barke of *Trees*) and at first they appear *white, bloodless*, and like a *gelly*; and so continue till they are ripe for publick employment. The *Guts* with the *Stomack* seem at first like white threads, waved or contorted, extended through the longitude of the *belly*: and together with them the *Fabrick* of the *Mouth* is discovered; from which to the *Fundament* in a continued procession, the top

is united and linked to the bottom: the *Genitals* also are about this time visible.

Yet hitherto the *Bowels* and *Guts* are not shut up within the *hollow* of the *body*, but being fastned as it were to the *Veines* hang forth: and thus doth even the *Heart* himself. For the *trunk* of the *body* hitherto resembles a *Skiff* without a *deck*, or a *House* without a *roof*; as being hitherto no way covered over by the *anteriour parts*; namely, the *Breast*, and *Abdomen*.

But so soon as the *Sternum*, or *breast-bone* is framed, the *Heart* enters into the *breast*, as into a *habitation* of his own setting up, and furnished purposely for him; and being now retired, like the *Genius* of the place, he undertakes the patronage of the whole *Mansion*; and there dwells, with his servants the *Lungs*. After this, the *Heart* and *Stomack* retreat too; & at last the *Guts* shrowd themselves in the *Belly*. So that in a *Hen-egge* after the tenth day of *Incubation*, the *Heart* admits no spectators without dissection.

About this time the top of the *Bill*, and the *Claws* break forth, being all exceeding white; and now a *chylous* matter is visible in the *Stomack*, and a kind of *Excrement* in the *Guts*; and the *Liver* being now begun hath the *Gall*, which appears green adjoined to it. By which it appears, that a different *Concoction*, and *Preparation* of the *Aliment* is now made, (whereof these are the *Excrements*, from that which is performed by the *Propagations* of the *Umbilical Vessels*: so that a just doubt may hence arise, how *Choler* (the *Excrement* of the *Second Concoction*) can be separated from the rest of the *Humours* by the *Livers* help, when it is it self in being at the same time with the *Liver*.

The



The Interiour parts are Universally generated, after the Order proposed: for in all Animals (which I ever dissected) they are framed after the same Manner, and Order: and especially in the more perfect, in Four-footed Beasts, and so in Man himself; In whom the Heart, Liver, Lungs, Spleen, and Guts, appear framed, and augmented in the Second, Third, and Fourth Moneths, at which times they are white, as also the whole Body. And hereupon the *first days* are not improperly called in *laite dies*, the Dayes in the Milk; for the Bowels, and all the other parts appear *spermatical*, except onely the *Veines*, and chiefly those of the *Navel*.

The *Umbilical Arteries* are, I conceive, framed after their Name-sakes, the *Veines*; because they are scarce to be found in the *first moneths*, and take their Original from the Branches which descend to the *Thighes*: And therefore, I conceive, they are not constituted before that part of the *body*, (from whence they are derived.) But the *Umbilical Veines* are conspicuous long before any part of the Body is in hand.

What I have now delivered, hath been ratified out of many *dissections* of humane *Embryo's* of (almost) all sizes: for I have observed them from the bigness of a *Tad-pole*, till they became of the longitude of *seven or eight fingers* breadth, and so upwards to the Birth. And especially in the *second, third, and fourth moneths*; at which times the greatest Alterations befall them, and the progress of Generation is most evident.

Therefore, in a humane *Embryo* of *two moneths* old, those very things which we have related in the *second Process*, do appear begun. For in the *first moneth* I conceive there is *little or nothing* of the *fetus*

*fetus* extant in the womb ; at least I never found any thing. But that moneth expiring, I have frequently seen a conception cast out (like to that which *Hippocrates* relates to have fallen from the Minstrell) of the bigness of a *Pheasants*, or *Pigeons* egge, and it was of an *Oval* figure, just like an Egg with the *Shell* pilled off; but the thicker membrane (called *Chorion*) encompassing it, was plastered on the out side, as it were, with a *mucous substance*, (especially in the obtuser end) but within it was slippery, being full of clear and stiff water, containing nothing else at all.

In the second moneth, I have often seen such a kinde of Egg (but larger) ejected upon indications of *Abortment*, namely the *Lochia ichorosa*; and it hath been sometimes entire, and sometimes broken, covered over with clotted blood. Within, it was smooth and slippery, the blood adhering without, and its form was like the other. In some of these ejections I have found a *fetus*, in other, none. That *fetus* hath been of the length of the nail of the little finger, but the shape was like a little frog, save onely that the head was great; and the leggs extremely short: just like the *Tadpoles* in June, which when their limbs begin to shoot out, they loose their tail, and put on the shape of *Frogs*. All its substance was white, and so soft and gellyish, that unless it were cast into clear water, you could not hold it in your hand. The face was like that of other *Animals*, as of a *Dog*, or *Cat*, without lips, and a wide mouth from one eare to the other.

Divers Women, whose Conception (like an addle Egge) is fruitless, and without a *Fetus*, do suffer abortion the third moneth. I have often dissected an abortion of that age (being of the bigness of a Goose-egg) wherein was a *fetus*, distinct in all its parts,

parts; though their form was rough, and unshapen, The Head, Eyes, and Limbs appeared, but the *Muscles* were confused: having no bones, but in their places, certain *Lineaments*, and softer *Gristles*, as it were; the substance of the Heart was most white, having two *Ventricles* of equal magnitude and thicknesse, and a double *Cone*, like two small *Twin-kernels* of a *Nut*; the *Liver* was wondrous litle, and also white. All this time, namely, for three moneths space *Vix quicquam Placenta, five bepatis Uterini*, scarce any thing of the *After-burden* is to be seen.

In all these kinde of *Conceptions* (as many as I have seen) I still found the *ambient membrane* fraught with a vast quantity of watry substance: in which the floating *Embryo* is so exceeding small, compared with the place where his abode is, and hath withall so long and winding a *Navel*; that those *waters* ought not upon any tearms to be thought the *sweat*, or *Urine* of the *Embryo*; but more probably, his *nutriment*, provided by nature (like the *Colliquamentum* in the *Egge*.) For I could finde no indication to induce me to believe, that that *conception*, or *Egge* had any connexion to the *Womb*: onely the outward *superficies* of the *obtusiferend*, looked something more wrinckled and thick; like the first intention of a future *placenta*.

Moreover those *Conceptions* appeared to mee, like certain *egges*, which were onely to be harboured within the *Womb*, but to be nourished (like the *Henne-egge*) by their owne *projection*, or *industry*.

Now in the fourth moneth, you would admire how much the *Fætus* is improved; for by this, he is encreased from a *Thumb-length* to a *Span*: and all



all his members appear *distinct*, and have a tincture of *Blood*; the *Muscles* of the *Limbs*, and the *Bones* are now apparent; and also the *Rudiments* of the *Naules*; and the *Embryo* begins to bestirre himself soundly. Yet the *Head* is still very bigge; and the *Face* without *Lips*, *Cheeks*, or *Nose*: the chasm of the *Mouth* is very large, whose space is half supplied by the *Tongue*; the *Eyes* small, and without *Lids*; the middle part of the *Fore-head*, and all the upper-part of the *Head* is covered with a *Membrane*, which is not as yet *cartilaginous*, so far is it from being *Boney*: but the hinder part of the *Head* is something hard, and *Cartilaginous*, implying that the *Skull* beginnes to grow solid.

The *Genitals* likewise did appear, but the *Testicles* were seated within the *Abdomen* (where in females the *Uterus* resideth) the *Scrotum* remaining empty. The *Feminine* parts were imperfect, and the *Uterus* with its litle *Tubuli*, did represent *formam bicornem*, the two horned shape of the *Uterus* of a *Lamb*.

And now the *Placenta* was enlarged, and affixed to the *Womb*; comprehending almost halfe the *Conception*; appearing to my eye like a *Tumor*, or fleshy excrescence of the *Womb*: its *Gibbous* part did stick so fast, even throughout its whole extent, to the *Womb*, which was now grown thicker. In to this *Placenta* the litle *Umbilical branches* (like slender rootes into the *Earth*) did insinuate themselves: and by its mediation the *Conception* was now first tyed to the *Womb*.

The large and fluid *Brain* resembled *Cheese-Curd*, and was embroidered with larger *Veines*. The two *Ventricles* of the *Heart*, both of the same magnitude, and their walls equally thick. In the

Region of the *Breast* within the *Ribs*, I saw three hollow places, and those not much unlike each other: the lowest of which, the *Lungs* having *Blood* in them, and of like complexion with the *Liver* and *Kidnies*, did inhabit: the middle was possessed by the *Heart* and *Pericardium*: but the upper was filled with that large *Glandule* which we call *Thymus*, the *Sweet-Bread*.

In the *Stomack* was *Chyle*, of like substance to that in which the *Embryo* swims: There was also a coagulated substance which was white, like to those white curded pollutions which the *Midwife* washeth off from the *Infant* (especially from the foulds of the *Skin*) so soon as it is borne. In the superiour *Intestines* was *Excrement*, or some part of the *Chyle*, in the inferiour a little dark excrement. In the *Bladder* was *Urine* found: and *Gall* in the *Vesicle* designed for its reception. *Intestinum Caecum*, the *blind Gut* (just as it is in grown persons) like an empty superfluous appendix of the *Colon*; and nothing like what it is in other *Animals*, (as the *Hogge*, the *Horse*, and the *Hare*) in which it is like a *Second Stomack*. The *Omentum*, or *Kell*, did like a *Gaule*, or thin transparent cloud, lye floating upon the *Guts*.

The *Reines* at this time are not formed into a gibbous figure, as it is when men are grown, but are moulded of several gobbets (as you see in a *Calf*, and in a *Sturgeon*) as if to every sprig or divarication of the *Ureters*, there were a gobbet or *Teat*, out of which their *Ovifices* did draine the *Urine*. Upon the *Kidnies* there are the two *Glandules* (which *Eustachius* first found out) wherein store of *blood* lies; and their *Vein*, which *Anatomist* call *Adiposa*, seems not much less then the *Emulgent* it self. The *Liver*, and *Spleen*, are equally full of *blood* (according

cording to their several proportions.)

And here we must observe by the way, that in every *Humane Fetus* that is lively and well, perfect *Milk* is found; wherewith chiefly the *Glandule Thymus*, or the *Sweet-bread* is stored. It is also found in the *Pancreas*, and almost all along the *Mesentery*, in certain *Vena Lactea* as it were, and the *Glandules* placed between the *divarications* of the *Meseraicke Veins*. Nay sometimes it may be milked out at the *breasts* of *New-borne Infants*, and sometimes also it starts out of it self: which some *Midwives* say, doth make for the *Infants Health*.

And that it may plainly appear, that the water (which is so plenteous in the *Conception*) is no excrement discharged by the *Embryo*, as either his *Sweat*, or *Urine*; it is lesse (in proportion) neer the birth (when the *fetus* is now more grown, and upon that account doth accumulate more excrement, because he requires more nourishment) then in the *first moneths* of *pregnation*. And moreover, at that time his *bladder* is full, and distended with *Urine*. And to say truth, that passage, (which *Anatomists* call the *Urachus*) which should (as they phantasie) convey the *Urine* from the *bladder*, through the *Navel*, could never yet be found out: but I have often seen the *bladder*, pressed or griped with the hand, discharge the *Urine* out at the *Yard*, but never at the *Urachus*.

And let this suffice, concerning what we have observed in a *humane Fetus*, so farre forth as it relates to the knowledge of the Order of the *Parts*.

In the Fourth and last Process, the parts of meaner rank and condition are formed: such as do not simply relate to the very being, and preservation of the Animal, but onely *ad tutelam*, to



its safe-guard against forreign injuries : or *ad ornatum, vel pugnam*, to its Ornament, or for Defence.

For that kind of *Safe-guard* or *Defence*, the utmost part (namely the *Skin*) is chiefly constituted, and all that proceeds out of it; as the *Scarfe-skin*, the *Haire*, *Wool*, *Plumes*, *Scales*, *Shells*, *Claws*, *Hoofs*, and the like. And indeed it is a prudent contrivance of *Nature* (who never makes any thing indiscreetly,) to beget those parts last of all, whereof she hath no use till after nativity. And therefore the *Chicken* is borne with down only on him, and not Feathers (as other *Birds* are, who are presently fitted for *flight*) because by wandring to and fro, he earns his sustenance with the industry of his *Legs*, rather than his *Wings*: And so again young *Ducklins*, and *Goslings*, who prey in the water, have their *Plumes*, and *Wings* later perfected than their *Legs*: which is clean contrary in young *Swallows*, which, because they are to fly about to glean up a living, are sooner versed in flight, than walking.

Now the *Down* starts up in the *Chicken* after the Fourteenth day, when the *Fetus* is now compleat, and provided with all his parts. But in many of them, at their first nativity, it looks like *dark spots* or *points*; and after that the *Feathers* sprout up like *Grasse* in the field, and at last expatiate, and cloath the body round, protecting it from the inclemency of the *Aire*.

The *Feathers* differ from *Quills*, in form, use, and place of Production. For *Chickens* are Feathered ere they have *Quills*: for *Quills* spring only in their *Wings*, and *Rump*; and stick deeper in the bottome of the flesh, or the very *Periostium* it self, and are useful to motion: but the *Feathers* rise

Ex.LVI. according to Experience.

341

rise out of the superficies of the *Skin*, and serve for protection.

*Nails, Hair, Hornes, and the like, saith Aristotle, are bred out of the Flesh, in so much that they change colour with the Flesh: for the white, and black, and diverse coloured, are made so, according to the different complexion of the Skin. But in our Chicken, all this is clean otherwise, for what various colour soever the Feathers be of, the Skin beneath them is of one onely. And many times one and the same Feather is diversly painted and discoloured, for the pomp and beauty of the Fowle.* De gen.an. l. 2. c. 4.

Likewise in the *Humane Fætus*, the *Cutis* and all the *skinny parts* are last perfected. And therefore at the beginning, there are neither *Lips*, nor *Cheeks*, nor *Ears*, nor *Eye-lids*, nor *Nose* to be seen: and that line wherby the *upper-lip* is united into one, doth close the last of all.

The *Humane production* is also borne *naked* and *unarmed*; as one whom *Nature* had intended for a *sociable*, *political*, and a *peaceable creature*: and to be ruled more by *reason*, then constrained by *force*. And therefore she hath furnished him with *Hands*, and *Understanding*, that having provided *properties*, he might *cloath*, and *defend* himself. For those *Animals* whom *Nature* hath made strong, she hath also armed with *weapons* agreeable to their strength: but where she hath denied strength, she hath bestowed wit, and cunning, and an admirable dexterity to evade affronts.

The *Ornaments*, as the *Tuft* upon the *Head*, the *Comb*, the *Gills* and the like, wherewith the haughty *Animals* swagger, are for the most part imparted to the *male*, more then the *female*: as also all *weapons* too, as *Teeth*, *Hornes*, and *Spurs*, &c. which appoints them for the *Battail*. And they are then

completest in the *male*, about that time when the *female* is in her prime, and provoked to leave an *Heir* behind her. For they are yet to come in the *younger Animals*, and in the *aged* they wither, and decline (as uselesse,)

Our *Dunghil-Cock* (that famous Champion) so soon as he is strong, and ripe for generation, is provided of his *Spurs*, *Comb*, and *Plumes*; by which he becomes amiable in the sight of his *Concubines*: and combats other *Cocks* not from any vaine Itch of *Ostentation*, but to perpetuate his own *Linage*, that so he that is best able to protect himself and his *Charge*, may have the prerogative to propagate the *Species*. For all those *Animals* which are well appointed with armes, and more *Martial* creatures then the rest, do ground their *quarrels*, either upon the *Rescue* of their *Young*, or their title to their *habitations*, or their husbandry for their *provisions*, but in chief, upon *Rivalship* in their *Loves* (and that, for posterities sake) and being subdued, as they lay by their *pomp*, and disdainful demeanour, so they surrender their claim to their *Wives*; and with dejected *spirits* languish out their days; while the *Victor* fleshed with the conquest, riots in the injoyment of the *Captives Females*.

Nor is this their bravery any ascitious *Wardrobe*, or some few daies Pageantry, or Masquing-stuff, but a lasting one, and Natures liberal *Dowry*, which delights not onely in the Embroidery of *Animals* (and chiefly of *Birds*) but hath imploied her Pencil upon *Flowers*, and *Plants*, adorning them with wonderful *Art* and variety of *colours*.

Certain



*Certain Paradoxes, and Problemes  
to be considered of, concerning  
this Subject.*

EXECUT. LVII.

**T**Hus far have we spoken concerning the *Order of Generation*: by which the difference between those creatures which are produced by a *Metamorphosis*, and those which are borne by an *Epigenesis*, hath been discovered: as also, between those that spring from a *Worme*, and those that arise from an *Egge*: for these are bodied out of one part of the prepared matter, and fed with the other; But they take up the whole matter in their frame, or *Constitution*: these are together augmented and formed; they are *augmented* first, and from a *Canker-Worme* grow into an *Aurelia*, and are afterwards formed and made consummate *Animals*, as *Butterflies*, *Silk-wormes*, and such like *Animals*.

And therefore *Aristotle* (as *Fabricius* observes) as he constitutes a kind of twofold nature of the egge, and a kind of twofold Egge in these creatures; so he laies down a twofold action, and a twofold Animal produced by it. For (saith he) out of the first eggges, which are the first rudiments of the Generation, a Worm constantly doth proceed: namely, out of the Eggges of *Flies*, *Ants*, *Bees*, *Silk-wormes*, &c. in which a certain fluid matter is contained, and out of all that fluid matter is the Worme made. But out of the second Eggges, which are layed by the Worm himselve, the *Butterslie* is born, and proceeds; that is, a Vo-

*latile Animal*, which is concluded in a kind of *Shell*, *Skin*, little bag, or *egge*, and when that bag is broken it departs thence, as *Aristotle* delivereth concerning the *Locusts* *egges*. Lastly these are perfected by a succession of parts; but they (namely, such as are generated by a *Metamorphosis*) are made intire at once. And in the same manner, are both *Spontaneous productions* generated, which obtain their first matter, and first extraction from *putrefaction*, *filth*, *dew*, *excrements*, or out of the parts of *Plants*, or *Animals*; as also those *issues* which proceed from the seed of *Univocal Animals*. For it is common to all *Animals*, to desume their *Original* from seed, or an *egge*: whether that seed proceed from other *Animals* of the same species, or happen there casually from some thing else. For as it sometimes befalls in *Art*, so also in *Nature*; namely, that the same things are sometimes casual, which at other times are effected by *Art*: as *Aristotle* doth instance in *Health*, so in like manner is the *Generation* of any *Animals*; (as far as they proceed from *Seed*) whether their seed be casual, or else proceed from an *Univocal Agent* of the same kind. For even in casual seed, there is a *motive principle* of *Generation*, which can generate out of it self, and by it self: and the same thing is found in it, as in *Univocal Animals*; namely, a power to form a living creature. But of this more at large hereafter.

Now some *Paradoxes* do here arise to be examined. For since the *Macula* is dilated, the *Colligamentum* concocted, and prepared, and many other things (not without great providence) ordered, towards the formation, and growth of the *Chicken*, before any particle of the *Chicken* appear; what should hinder the *Innate heat*, and *vegetative*

*soul*

soul of the *Chicken* to be existent before the *Chicken* it self? For what can produce the effects and operations of *Life*, but that which is the *cause* and *efficient* of those *Effects* and *Operations*; namely, the *heat*, and *faculty* of the *Vegetal soul*? And therefore the soul doth not seem to be *Actus corporis Organici vitam habentis in potentia*, the *Act* of an *Organical body*, which hath *life* in it *in potentia*: for we conceive the *form* of the *Chicken* to be such an *Act*. Now in what can we imagine the *form*, or *soul* of the *Chicken* to be, but in the *Chicken* it self? unless we allow the *forms* to be separate, or grant a *Metempsychôsis*.

But this is most manifest, where the same *Animal* lives by a succession of forms; (as *Aristotle* speaks) as for example, Out of a *Canker-worm*, an *Aurelia*, and then a *Butterfly*. For the same *Efficient*, *Nutritive*, and *Preserving principle*, must needs be in each of these: unless we will place one soul in the *Boy*, another in the *Young man*, and a third in the *Old*: or affirm, that the *Canker-worm*, and that worm which becomes a *Silk-worm*, also the *Silk-worm*, and the *Butterfly*, have the same form, of which matter *Aristotle* hath accurately written, and whereof more largely hereafter.

Again, it seems a *Paradox*, that the *blood* should be made, and move, and be endowed with *Vital spirits*, before any sanguifying, or *Motive Organs* are constituted at all.

Nor is it less new and unheard of, that there should be *Sense* and *Motion* in the *Fætus*, before his *brain* is made; for the *Fætus* moves, contracts, and extends himself, when there is nothing yet appears for a *brain*, but clear *water*.

Besides, the *body* is nourished and encreased, before the *Organs* dedicated to *Concoction* (namely the



the *Stomack* and *Liver*) are formed. And likewise *Sanguification* (which is the second *Concoction*) is performed before the first, (which is by the *Stomack*) and called *Chylification*.

The *Excrements* of the first and second *Concoction* (namely in the *Guts*, and the two *bladders*, of *Urine* one, the other of *Gall*) are coetaneous to the *concocting Instruments* themselves. Lastly, there is a *Minde*, *Providence*, and *Understanding*, not onely in the *Vegetal* part of the *soul*, but even before the *soul* it self; procuring, disposing, and ordering all things, and artificially molding the future *fetus* to a resemblance with his parents, even from the very first *original*; and all this, to advance the being, and well being of the *Fetus*.

Concerning which *Resemblance*, we may enquire, what should be the cause why the *Fetus* sometimes resembles the *Father*, sometimes the *Mother*, and sometimes also the *Progenitors*, and those ei her of the *Father* or *Mothers* side? And this the rather, since upon one single *coition*, and at the same moment of time, many *Egges* are fructified together. This also is a wonderful thing, that the *Virtues*, and *Vices*, the *Diseases*, the *Marks*, the *Moles* or *Spots* should be transferred to *Posterity*: and that into some onely of the *Progeny*, and not unto all. In the race of *Cocks*, some are of a generous *spirit*, and born to *battle*; who will dye rather then turn their backs upon their *Adversaries*: and yet their *Nephews*, unless they proceed of like parents, do by degrees forfeit their *galantry*; according to that saying, *Fortes creantur fortibus*. In many other *Animals* (and especially in *Man*) the *Bravery* of the *Succession*, or *Family* is observable: and many of the *Indowments* both of *body* and *soul* are derived down to it *ex traduce*.

This

LVII.  
likewise  
tion) is  
the Str-  
Conce-  
ders, of  
to the  
there is  
one-  
before  
order-  
figure  
a from  
nce the  
ay en-  
Fetus  
es the  
s, and  
? And  
m, and  
re fru-  
thing,  
Marks,  
utteri-  
y, and  
re of a  
ill dye  
verla-  
ceed  
galan-  
ur for  
illy in  
mily is  
oth of  
et.  
This

Ex.LVII. concerning this Subject.

347

This I have often admired, that when the Issue hath obtained a mixt *fabrick* or composition from both Parents, and that in all other parts of the body, yet it hath not been so in the *Genitals*; but that it commonly proves either *Male*, or *Female*, and very seldom an *Hermaphrodite*.

Lastly, many things are in the *fetus* ere they appear at all; and some things are begun with the first, but perfected with the last: as the *Eyes*, *Genitals*, and *Bill*.

And hence there arise debates concerning the pre-eminence, or dignity of the *Parts*; in which the Wits of such as are curious in these cases, may employ themselves. As, Whether the *Heart* bestow life and vigour upon the *blood*, or the *blood* rather upon the *Heart*? Whether the *blood* be made for the *bodies* sake, as the *Matter*, *Nutrimment*, and *Instrument*; or else the *body*, and all its parts for the *blood*, and the *soul* which doth first and principally reside in it? Likewise, Whether the *Ventricles*, or *Auricles* of the *Heart* are most honourable? For we finde that the *Auricles* have life and pulse first, and do expire last. And farther, Whether the *left Ventricle* of the *Heart*, which is deeper in a *Man*, and is fenced with a thicker and more carnous wall, and is conceived to be the *fountain* of the *Spirits*, be the more excellent, hotter, more fraught with *Spirits*, and *livelier* of the two: or the *Right*, which doth last languish and subscribe to Death, containing a large quantity of *blood*: and where the Dying mans *blood* doth last congeal, and is deprived of life and spirit? and whether also the *Umbilical Vessels* do transport the *blood* (as to their *fountain*) and whence also they derive their extraction?

Now these things do result out of the *Observa-*  
tion.

tion of the Order of the Generation of the Parts, as also other things which may be hence deduced, and do not a little clash against the *Physiology* commonly approved. Namely, (when we plainly see that there is both *Sense & Motion*, before the *brain* is begotten) it is evident that all *Sense* and *Motion* is not derived from the *brain*: for it appears by our *History*, that *Sense* and *Motion* do clearly discover themselves in the first small drop of blood in the *Egge*, before any particle of the body is framed. And likewise, the first platform or constitution (which we call *gelly*) is laid before any part is discerned; and when the *brain* is now nothing but a clear water: which first rudiment of the Body, if it be lightly pricked, will, like a *Worm* or *Magot*, obscurely move, and contract it self: which is a plain testimony of its *sense*.

There are also other Arguments deduced from *Sense* and *Motion*, by which we may conclude (with *Aristotle*) That the *Heart*, and not (with *Physicians*) that the *Brain* is the first Principle.

Those *Motions* and *Actions*, which *Physicians* call *Natural*, because they proceed whether we will or no; and we cannot moderate, accelerate, retard, or refrain them at our own pleasure: & which therefore are Independent in regard of the *brain*; yet even they are not performed without all *sense*, but do imply *sense*, as by which they are excited, provoked, and altered. For we conceive, that in the *Heart* it self, its *Palpitation*, *Trembling*, *Fainting*, *Sowning*, and all the changes in the *pulse*, either in magnitude, celerity, order, *rhythme*, or the like, do proceed from *morbifical causes* indisposing it, and offensive to its *sense*. For whatsoever by diversity of motions makes warre against those things that enrage and molest it, must needs be indowed with *sense*.

The



## Ex. LVII. concerning this subject.

349

The *Stomack* and *Guts* provoked by injurious humours, do raise a *Nauseating*, *Belching*, *Rumbling*, *Vomiting*, and *Flux*; and as it is beyond our power, either to raise or lay these combustions, so are we to seek for any such *sense* retaining to the *brain*, which should excite those parts to such *Expressions*.

It is very strange, that upon the *Infusion* of *Antimony* taken in a *Vomit*, though we neither distinguish it by taste, nor finde any disgust in it, either swallowing it down, or in returning it back again; yet there passeth a censure upon it by the *Stomack*, which discerns between what is usefull and prejudicial, and so provokes to *Vomit*.

Nay, the *Flesh* it self doth easily distinguish a *poisonous wound* from one that is not *poisonous*; and thereupon contracts it self, and condenseth; upon which enflamed *tumours* arise: as we may see in the stings of the *Bee*, the *Gnat*, and the *Spider*.

I my selfe once, for experiment sake, pricked my *hand* with a *needle*; and presently rubbing the same *needle* upon a *Spiders tooth*, I pricked my *hand* in another place, so that I my self could not distinguish between the two pricks. But there was something in my *Skin* that did distinguish; for in that place where the *poisoned* prick fell, it presently contracted it self into a *pimple*, and presently grew red, hot, and inflamed; as if it fortified it self, and stood upon its *guard*, to oppose, and subdue the malice of the *Venom*.

The *Offences* undergone by the *Matrix*, as its *Contorsion*, *Descension*, *Falling down*, *Rising*, *Suffocation*, and other *Maladies* and *Provocations*, do no whit depend upon the *Brain*, or *Common sense*; nor yet can they be conceived to befall it insensibly. For that which is plainly void of *Sense*, cannot seem

seem any way to be provoked, or heightened into any motion, or action. Nor have we any other signs to distinguish an animate and sensitive creature, from a dead and senseless one, then by its motion provoked from some offensive object, which doth always follow, and argue Sense.

But of this more at large, when we treat of the *Actions and Use of the Brain*. But the Reverence due to the *Antients*, and *Antiquity* her self, doth advise us to uphold their *doctrines*, so farre as they are true. Nor can it beseem us rashly to reject, and discountenance their *Labours*, and *Decrees*, whose light hath been our direction to the Shrines of *Philosophy*; wherefore I conceive we ought to think thus. We perceive we have *Five Senses*, by which we give judgement upon outward things; but because it is not the same sense, by which we perceive, and by which we perceive our own perception; (for we see with our Eyes, but we do not by them know we see) but by another sense, which employes another sensitive Organ (namely, the *Internal Common sense*) by which we give judgement upon all those things which we perceive by our external Organs, and so distinguish white from sweet, and hard: This common Sensorium, or Organ of Sense (whither all Species are conveyed from the outward Organs) is plainly the Head; which, together with all his Nerves, and outward Organs adjoined to them, is understood to be the adequate Organ of Sensation. And it is like the Sensitive Root, from which several Fibers result; whereof one sees, another hears, a third toucheth, and the other smell, and taste.

Yet as there are certain *Actions and Motions*, whose Regiment or Jurisdiction relates not to the Brain, and they therefore are called *Natural*:

So also must we conclude, that there is a certain *sense* of *Touching*, which is not conveyed to the *Common sense*, or any way communicated to the *brain*; and therefore in that kinde of *sense*, we do not perceive our *sensation*: but just like *men* whose *understanding* is perverted, or else are distracted by some violent *Passion*, insomuch that they are insensible of all *pain*, and takes no notice of any thing that meets their *senses*: So we must conceive it to be in this *sense*, which we therefore distinguish from *Animal sense*. Having observed such a kinde of *sense* in the *Zoophyta*, or *Plant-Animals* (as the *Sensitive Plant*, *Sponges*, and the like.)

Wherefore, as many *Animals* have both *Sense* and *Motion*, without the *Common sense*, or a *brain*; as the *Worms* in the *Guts*, also those *Worms* which turn into *Silk-worms*, and the like, so also do some actions befall the *Embryo*, and us also without any assistance from the *brain*, and a kinde of *sensation* doth proceed, without *sense*. And as *Physitians* teach, that *Natural Actions* differ from *Animal*; so upon like reason, the *Natural Touch* seems to differ from the *Animal sense* of *Touching*, and constitute a distinct species of *Feeling*: so that the one is communicated to the *Common sense*, or *brain*, and the other not.

Moreover, it is one thing for a *Muscle* to be moved or contracted, and another thing for it to perform an *Action*, at distinct regulated contractions and relaxations; as to go forward, or receive any thing in the *hands*. Doubtless, the *Muscles*, or *Motory Organs*, in the *Cynical distortion*, or *Convulsion* proceeding from some cause that disturbs them, are no otherwise moved, then a *Cock* or *Hen*, which when the *Head* is quite chopped off, is disturbed with many convulsive motions of the *Leggs* and *Wings*: but such



such as are altogether confused, and disordered, because the sway of the *brain* is dethroned, and the *common sense* deposed, under whose Government formerly, those motions were regulated by *rhythms* and *harmony*, either to *walking*, or *flight*.

We conceive therefore, that it ought to be said, That all *Natural Motions* proceed from the power of the *Heart*, and are as his *Retinue*: but the *Spontaneous*, and such as perfect any *Action*, (which *Physitians* call *animal*) are not produced but by the *brain* and *common sense* controuling them. For as by this *common sense*, we perceive our own *Sensation*, so also we perceive our own *motion*; and that whether it be *regular*, or *perverse*.

We have a clear Instance of both these *motions* in *Respiration*; for the *Lungs* (as the *Heart*) are continually moved up and down by a *natural motion*, and also provoked to cough, and frequent *Agitation*; but produce or shape a *voice*, or sing they cannot, without help, and commission from *common sense*.

But these things are to be more fully handled, when we shall fix our contemplation upon the *Action* and *Use* of the *Brain*, and the *Consideration* of the *Soul*. But thus much hath been delivered by the way, that we may declare our desire and inclination to pay our *Masters* the respect we owe them.

of

Of the Nutrition of the Chicken in  
the Egge.

EXERCIT. LVIII.

**H**OW much the *Authority* of the *Ancients* is not rashly to be rejected, appears even in this : It was of old an opinion much prized (which yet many at this day disclame as *erroneous*; and *Fabricius* decryes it as a meer delusion, and fond persuasion) that the Embryo did suck, in its mothers Womb : and it had *Democritus*, *Epicurus*, and *Hippocrates* himself for its Abettors. And *Hippocrates* doth establish his opinion chiefly upon two arguments; For, saith he, unless it had sucked, how could it deposit any excrements : or know how to suck so soon as it is born.

Now in other cases they use to subscribe to every word pronounced by this so famous, and ancient Oracle, and his *autors* son was warrant enough : but here (because he delivers things dissonant to what is commonly received, *Fabricius* doth not only renounce his bare assertion, but stands out in defiance against his proofes. Therefore I appeal to the judgement of the most skilful *Anatomists*, and most learned *Physitians*, whether our Observations concerning the Generation of Animals, do not onely cast a probability, but inforce the necessity of this opinion of *Hippocrates*.

All in general acknowledge, that the *Fetus* while he abides in the Womb doth wallow in abundance of Water, (which Liquor, we, in the History of the Egge, stile the *Colliquamentum*, and the

Moderns say that *Water* is the *Sweat* and *Urine* of the *Fetus*; affording this advantage, that the *Fetus* floating in it (while the *Mother* runs, leaps, or uses any other violent motion) doth not easily offend the *Womb*, nor is himself wronged by allision against the *bones* seated there round about him, or some outward blowes; and the rather, for that at this time, his *body* is but tender, and infirme.

pag.137.

*Fabricius* adjoines other benefits arising from these *Waters*; namely, Their moistning and lubrifying all the passages round about, and rendering the neck of the *Matrix* capable of the largest dilatation; and all these commodities, saith he, do no less arise from that thick white Excrement, answerable to that of the third concoction, which is *Unctuous*, *Oily*, and *Fat*, and neglected by the *Ancients*. Which it also performeth, least the *Sweat* which may sometimes transpire, sharp, and saltish, should erode the tender *Infants* body.

I willingly acknowledge the several benefits assigned to this water, by all Writers; namely, that the tender *Fetus* in order to his indemnity from any suddain, and violent motions of his *Mother*, is thus securely nestled in *alis vesperilionum*, in the *Bats* Wings, as they call them, and moated round with store of water, so that he cannot easily, by every (though violent) motion dash himselfe against his *Mothers* sides; (because of those ties which fasten him on every side) at least this circumambient liquor being equally poised in the midst doth protect him from all outward harme. But my own Observations, as they do in many other matters, so also in this enforce me to be of a contrary opinion to *Fabricius*: for I am most certain, that the said liquor, is not the *Sweat* of the



the *Fetus*. Nor can I believe, that that *water* doth perform those offices in the *birth*, which he commemorates : and much lesse, that it is so sharp and *Briney*, that the *fetus* must stand in need of an oily unctuous fence to secure him from it, especially that *fetus*, which is either cloathed with *Wool, Hair, or Feathers*. For this *liquor* is of a good savour, and like a kind of watry Milk ; and therefore, almost all *Viviparous Animals*, so soon as they have brought their *Young* into the world, fall aboard and eat it up, and lick their new born *issues* clean, greedily swallowing the humour which they receive in, when they will not so much as touch the *excrements* of their *fetus*.

*Fabricius* conceived this *water* to be *sharp*, and *salt*, because he thought it to be the *sweat*. But what injury, I pray, can the *sweat* do to the *fetus* now cloathed in *feathers* ? if at least he ever saw such a creature as a *sweating Chicken*.

And I suppose he will not say, that the use of that *water* in an *egge*, is by its *moisture* and *lubricity* to expedite the *Chickens birth*. For the dryer and older the *shell* is, by so much the *frailer*, and *brittler* it becomes. Lastly, were it the *Chickens sweat*, it would most abound neer the *Exclusion* ; for the larger the *Chicken* is, and the more *Aliment* he takes in, so much the more *sweat* must he necessarily create. But a litle before his *Exclusion* (about the *nineteenth* or *twentieth day*) there is none of this kind of *humour* discernable : whereby, he should have rather reputed it an *Aliment*, then an *Excrement* : (had he rightly considered the matter) especially, seeing he allows the *Chicken* in the *Egge*, the use of *Respiration, Voice, and Crying*, which, were he begirt with *water*, could not have been.

Nor are these *Waters* of any great use, to the Expedition, or Lubricity of the *Delivery* (as experienced *Midwives* know full well) though *Fabricius* would have it otherwise. For the neighbour *Parts* are about that time, (without any profusion of those *Waters*, mellow and relaxed by a certain maturity of their owne: especially, those which may be an obstruction to the work: namely, the *Ossa pubis*, & *Coccygis*; about which the chiefeft care of the *Midwife* is exercised in furthering the *delivery*: for she is less solicitous, to appoint the fleshey parts, least they rend in sunder; then in putting back the *Coccyx*; which if she cannot effect with her own hand, she calls in the *Man-Midwife* to procure her purpose by the *Speculum matricis*; which instrument by its triple sides, whereof one is applyed to the *Coccyx*, the other two to the *Ossa pubis*, doth distend those parts by force.

For the *Infant* now just at his Birth, while hee turnes himself, and precipitates his *Head* downward, doth relax and open the orifice of the *Womb*: but if in his descent he light upon the top of the *Bone*, there he sticks; and hardly gets forth, and that not without danger, to himself, and his Mother too. Now it is evidently natures intent, to mollifie and relax those parts. For, if the *Midwife* do discover the *Orifice* of the *Matrix* become soft and loose, she laies it down for an infallible sign of the approaching *delivery*, though the *Waters* are not yet broken. Nay (I speak what I know by Experience) in case any thing remaine after the *delivery*, which ought to be discharged, or if at any other time there be any thing in the *Womb*, which it indeavours to be rid of, the *Orifice* doth not onely descend, but is also soft and relax-

relaxed:but if after the *delivery*,that *Orifice* be retired into its place, and be perceived to be grown something hard,it is an evident sign that all is well.

And by the like *Experience*, I pronounce, the *Ossa pubis* to be often loosened one from another in *delivery*, their *cartilaginous* connexion being mollified, and all the *Region* of the *Lower Belly* miraculously dilated; and this not by the profusion of the *Warry substance*, but of their own accord, as ripe *fruits* use to revolt or open, to make room for the *Exclusion* of their *seeds*. But how much the *Coccyx* may retard the *delivery*, is clear in four-footed *beasts*, that have *Tailes*; for they can neither bring forth *young*, nor disload the *excrements* of the *Guts*, unless they remove their *Taile*; which if you depresso with your *hand*, you hinder the passage of the *Excrement*.

Moreover, that is accounted the most *Natural Delivery*, when the *Fetus* and *Secundines* with the *Warry substance* (that is, the *Entire Egge*) get forth together. For if the *Secundines* be entire, and the *waters* not broken, the circumjacent parts are more distended,& dilated by the *Throwes*, namely, by the distention of the *Membranes*, whereupon, the *fetus* works his release with less struggling; though the *Mothers paines* be the greater. In which condition, we know how the *Woman in Labour* is much relieved from the intollerable torment caused by distention, upon the breaking of the *Membranes*, (whether it be done by *Midwives* nailes, or by a pair of *Scissors*) the *Waters* by that means being set a float.

And the skilful *Midwives* know very well, that in case all the *Waters* be come away, before the natural opening of the *Womb*, the *Woman with Child*, continueth the longer in *Labour*, and her *Travail*



is the harder ; which would yet be contrary, in case those precedent *Waters* (as *Fabricius* would have it) did so much conduce to the *mollifying*, and *Lubricity* of the *parts*.

Besides that this humour, which we call the *Colliquamentum*, is not the sweat of the *fetus*, is evident, both in the *Egge* and other *Animals*; for it is in being, before any part of the *fetus* is constituted, or any rudiment of him extant. Nay so soon as he is discernable, and is yet but gelly, and very small, so great a quantity of *Water* is to be seen, that it is utterly impossible, so inconsiderable a *bulk* should afford such plenty of *Excrement*.

Adde to this, that the *fibres* of the *Umbilical vessels* are scattered and terminated in the *membrane* containing this *Water*, as in the *Tolk* and *White* of the *Egge*: to give evidence clearly (if you consider the thing, as it truly is) that this humour, is rather to be conceived the *Aliment*, then the *Excrement*.

Wherefore *Hippocrates* his opinion seems to me more probable then that of *Fabricius*, and other *Anatomists*, who count this *Liquor* the *Sweat*, and *Prejudice* of the *fetus*. For I believe that this *Colliquamentum*, or *Water* wherein the *fetus* swims, doth serve for his sustenance; and that the thinner & purer part of it, being imbibed by the *Umbilical Vessels*, do constitute and supply the *primogenit parts*: and the rest, like *Milk*, being by *suction* conveyed into the *Stomack*, and there concocted or chylified, and afterwards attracted by the *Orifices* of the *Meseraick Veins*, doth nourish and enlarge the tender *Embryo*. And to fortifie my persuasion, I shall lay down some arguments, that prevaile with me.

So

So soon as the *fetus* attains any perfection, he presently stirres his *Limbs*, and proceeds to make tryal of those actions, to which his *Instruments of motion* are designed. Now we see the *Chicken* in the *Egge*, open his *mouth* amidst this *Water*; whereby he must needs swallow it down. For it is most certain, that whatsoever is gone beyond the *roote* of the *Tongue*, and is arrived at the *top* of the *Gullet*, no creature can return (but by *Vomition*) whereupon the *Farriers*, which administer medicinal *Potions*, *Boles*, or *Pills*, to *Cattel*, taking them by the *tongue* cast it in beyond the protuberance of the *Tongue*, just at the *Root*, that so they cannot avoid the swallowing. And if any of us, convey a *Pill* so far as the *root* of the *tongue*, he shall find himself necessitated to swallow it down, unless a *Vomit* meet, and repel it. Wherefore since the *Embryo* wallowing in the fore-said *liquor*, doth open his *mouth*; it follows likewise that it must enter in; and since he moves his other *muscles*, why should we doubt, but that he imployes the *Instrument* of his *throat* likewise, and so imbibes the *humour*.

Moreover it is certain, that in the *Craw* of the *Chicken* (and the like is also found in the *Stomack* of all *Embryo's*) there is seen a *substance* most like in *colour*, *tast*, and *consistence* to the said *liquor*; which being a while digested in the *Stomack*, resembles *coagulated Milk*; and we have also found it like to *Chyle*, in the upper *Gut*, the lower *Guts* being then stuf with *Excrements*.

So also in the *fetus* of *Viviparous* creatures, the thicker *Guts* are full of such an *Excrement* as that, wherewith they do abound all the while they are fed with *Milk*. Also in *Sheep* and other beasts which divide the *Hoof*, the dried dung is manifestly to be seen.

About the *seventeenth day*, I have evidently found excrement in a *Chicken*, neer the *fundament*; and have also seen it, when it hath been discharged into the *Secundines*, a little before the *exclusion*. And *Volcherus Coiter*, a diligent and skilful *Anatomist*, records the same observation. Why then should we scruple to say, that the *fetus* in the *Womb* doth suck; and that a *Chyle* is made there; when we have both the apparent principle, and rejections of it.

Besides, at that time when we see both the *bladders*, one full of *Gall*, and the other of *Urine* (both which are excrements of the *second concoction*) why may we not conclude that *Chylification*, which is the first *concoction*, went before it.

The *Embryo* therefore sucks, and receives *nutriment* in at the *Mouth*. And this you shall soon discover, if so soon as ever he is borne, you put your finger into his month. Which according to *Hippocrates*, would not be, had he not sucked before in the *Womb*. For we see young Children make essays, and attempt upon all performances: namely, moving their *Limbs*, crawling along, and endeavouring to *speak*: all which they attain at last with dexterity, by long practice, and education. But so soon as ever they are born, nay before they are born, they will suck. For we have found by experience, that while they yet stick fast in the *Birth*, before they can either cry or *breath*, they will seize upon the finger extended to them, and suck it.

Nay, A *New-born Child* is more exact at sucking, than a grown body, or himself either if he discontinue it but a few days. For the *Infant* doth not compress the *Nipple*, and suck at the rate that we do by gulping down: but as if he would devour the



Ex.LVIII. *Chicken in the Egge.*

361

the Nipple, he still draws it into his *mouth*, and by the aid of his *tongue*, and *palate*, he sucks the milk, as if he chewed it; with farre more earnestness, and slight, then a *grown body*. Wherefore he seems to be good at it of old, and to have practised it in the *womb*; for we see how soon he unlearns it by discontinuance.

By these and other *Observations* it is probable, that the Chicken is fed two waies in the *Egge*; namely, both by the *Umbilical*, and the *Meseraick Veines*: by the former, he attracts well digested *aliment*, whereby the *Blood*, and *primogenit parts* are constituted, and encreased; by the other, *Chyle*, which conduces to the *fabrick*, and *augmentation* of the other parts.

Now, perhaps the reason may seem obscure, wherefore the same *Agent* should out of the same *Matter* proceed to a diverse manner of *Nutrition*: (when *Nature* doth nothing in vain) yet we will endeavour to discover the reason.

That *Part* which is attracted by the *Umbilical Veines*, is the purer and sincerer part: But the remaining *Colligamentum* wherein the *Fetus* floats, is a kind of crude *milk*, without cream, deprived of its purer part. The more pure part therefore stands in no need of farther *concoction*, as the other doth, which therefore is received into the *Stomack*, and there *chylified*. The thin, and crude *milk*, such as is found in the *breast* presently after delivery, is like this. For the dissolved *White* of an *Egg*, and the crude and watry *milk* in the *breast* or *udder*, are of the self same colour, taste, and consistence. Also the first *milk* given, is serous, and watry; and Women in *Childe-bed* do milk a kinde of water out of their *breasts*, before the *milk* is concocted, and perfectly white.

And

And therefore the *Colliquamentum* found in the *Chickens* crop is a kinde of crude *Milk*; and the very same afterwards found in the *Gisard*, is concocted, white, and coagulated. So likewise in *Viviparous Animals*, before their milk is digested in their breast, it looks like a kinde of *Dew*, or *Colliquamentum*; and so on the contrary, the *Colliquamentum*, after it is concocted in the *Stomack*, puts on the likeness of *Milk*. Whence it comes to pass, according to *Aristotles* opinion, that the first and most principal parts are fashioned out of the finer and purer materials: but of the courser, (by a new concoction in the *Stomack*) refined, the meaner and inferiour sort of parts are made: so that *Nature* like a kinde, indulgent mother, would rather abound with *Supernumeraries*, then be scantied in *Necessaries*. Or rather, we must affirm it consonant to reason, that the *fetus* now grown more perfect in himself, should also be sustained after a more perfect manner (*viz.* by the *Mouth*) and attract his aliment more refined, and rendered more devoid of dreggs, by the two precedent Concoctions; (As being thereby cleansed from two several sorts of Excrements.) At first, indeed, being sustained by the *Umbilical Vessels*, he lives like a *Plant* supplied by its root; and hereupon his body looks indigested, white, and imperfect; and like a *Plant*, he remains fixt, and immoveable. But so soon as he enjoys the same aliment more elaborate, as now inspired with a diviner spirit, and triumphing in a higher pitch of *Vegetation*, the former *Gelly* is transformed into *flesh*, the *Organs* of motion are distinct, the spirits are enricht, and he himself begins to move: and now no longer is cherished like a *Plant* by his roots, but lives the life of an *Animal*, and is nourished at the *Mouth*.

Of

Of the Uses of the whole Egge.

EXER: LIX.

**H**AVING declared those mutations, and several proceedings, which are required in a *Hen-egg*, in order to the production of the *Chicken*; *Fabricius* proceeds to discourse of the uses of the whole *Egge*, and of its *Parts*: and this not onely in a *Hen-egge*, but in all other kindes of *Eggs*. Where he also demands, Why some *Eggs* are heterogeneous, and compounded of diverse parts; and others are homogeneous, and similar? such as the *Eggs* of *Insects* are, and of those creatures, which are constituted out of the whole *Egge*, (by a *Metamorphosis*) and not generated out of one part of the *egge*, and nourished by the other, as the *Chicken* is.

But my business is not to treat of all *Eggs* in general (as not having in this Tract delivered their history) but onely of *Hen-eggs*, and the benefits or advantages arising from their parts: all which ought to tend to that, to which the Action of the whole is directed; which *Fabricius* truly observeth, to be nothing else but the Generation and Augmentation of the *Chicken*. pag. 50.

And amongst those things which relate to the Whole *Egge*, *Fabricius* doth recount the *Figure*, *Quantity*, and *Number* of the *Egges*. The *Figure* of the *Egge*, saith he, is round, that the whole bulk of the *Chicken* might be contained in the lesser space; for which cause God made the Universe Round, to comprehend all things: and for the same cause, this *Figure*, saith *Galen*, appeared alwayes most lovely, and convenient to Nature. Besides, in that it hath no angle exposed L. 10. de us. Part.



exposed to outward injuries; it is therefore esteemed the safest figure, and most convenient for the Exclusion of the Chicken. Now Fabricius upon this ground, ought to have assigned the reason, why Hen-eggs are not spherical (as the fry, or eggs of fishes, worms, and frogs are) but acuminate and oblong. What impediment is there which hinders them from this perfect figure? Therefore, in my judgement, the figure of the egge hath no influence at all upon the Generation of the Chicken, but is merely accidental; which I the rather conceive, because there are so many several varieties of figures, even in the Hen-eggs only. For the figure differs according to the diversity of the Uterus, in which (as in a Mould) it receives its form.

Hist. an. l.  
6. c. 2.

l. 10. c. 52.

Aristotle, indeed, saith, That oblong eggs produce Hens, but the rounder, Cocks: But I have never yet observed any such thing. And Pliny affirms the clean contrary: The rounder sort of eggs, saith he, exclude Hens, and the rest, Cocks. And, to say truth, if there were any certainty to be collected hence, some Hens would ever generate Cocks, and other, Hens: for some do lay eggs which are alwayes of one and the same figure, that is, ever oblong, or ever round. And the oblong would rather exclude Cocks, because they are the more perfect, and better concocted; and therefore Horace esteemed them to be more pleasant than the round.

Plin. ibid.

The Reasons alledged by Fabricius for the figures of the Eggs, we willingly pass by, because they are invalid.

As for the Magnitude of the Egge, that indeed doth seem to conduce to the largeness of the fetus, which is thence to be generated; for your great Hens lay fairer eggs. And yet the Crocodile  
Id. l. 8. c. 25; layes egges no bigger then Goose-eggs: no living crea-

ture

Ex. LIX. Of the Uses of the whole Egge.

365

ture spreading into so large a bulk from so small an Original. It is also probable, that the largeness of the Egge, and the plenty of the liquours contained in it, do conduce something to the fecundity of the Egge: for the very small eggs (called *Centenina*) are all of them addle.

The Number of Eggs affords the same benefit, as plenty of Conceptions do in *Viviparous* creatures; that is, they are useful to the continuation of the species. For Nature doth commonly bestow a plenteous issue upon those *Animals* which are weak, and lyable to the insolences of other *Creatures*: recompensing the shortness of their lives, with the number of their offspring. Nature, saith *Pliny*, hath bequeathed this legacy to the Race of Birds, that the more fearfull amongst them, should be more fruitfull, then the more valiant. For since all Generation is designed by Nature for *Perpetuity* sake, it befalls those *Animals* more frequently, which are shorter lived, and obnoxious to outward injuries, that so their species may not decay. Hereupon, Birds of Prey, which excell in strength, and thence maintain their lives the longer, and remain in more security, do seldom lay above two eggs. Indeed, the Pigeon, Turtle, and Ring-dove, hatch but two egges at once; but the frequency makes satisfaction for the paucity, for they hatch ten times a year. So that they Generate Much, though not Many.

L. 10. c. 52.

*Of the Benefits or Uses of  
the Yolk and White.*

## EXERCITATION LX.

pag. 47.

**A**N Egge, saith *Fabricius*, properly so called, is compounded of several parts, because it is the Organ or Instrument of the Generant; and *Galen* affirms, That every Organ consists of several parts. Which gives an occasion of doubt, whether every egge be not Heterogeneous, seeing every egge is an Organ. And indeed, every egge seems to be constituted out of several parts, even the very eggs of Insects, and Fishes: for they all consist of Membranes, Coverings, and Muniments; and the Matter also contained in them, is not altogether destitute of a dissimilar constitution.

*Fabricius* doth also farther conclude truly, with *Galen*, That some parts of the Egge are the chief Instruments of Action; others, such Instruments as the Action cannot be performed without them; others, as conducing to the better performance of the Action; and lastly, others, as usefull to the safety and preservation of all the rest. But he is deceived, where he saith; If we speak of the chiefe Action of all, which is the Generation of the Chicken, the chief cause thereof is the Seed, and the Chalaza; for these two are the prime cause of the generation of the chicken: the Seed being the Efficient cause, and the Chalaza the material onely. For, as *Aristotle* affirms, he must of necessity acknowledge, that the Generant must be within the Egge. But he denies the Cocks seed to be within the Egge.

Nor is he less mistaken concerning the Material cause,



Ex.LX. Of the Uses of the Yolk and White.

367

cause, out of which the Chicken is made by the artifice of the seed. For it is neither made of both the Chalazæ, nor yet of any one of them, as hath been discovered in our History. Nor is the Generation of the Chicken accomplished by a Metamorphosis, or delineation and division of the Chalazæ, but by an Epigenesis, as we have explained. Nor is the Chalazæ principally fructified by the seed, but the cicatricula rather, or the Eggs-eye, as we call it: out of which being enlarged, the colliquamentum doth result: and afterward in the colliquamentum, and out of it, the Blood, Veines, Vesiculæ pulsantes, and the whole Body is at last constituted. And upon his own confession, the seed of the Cock doth not so much as pass into the womb of the Hen at all: and yet notwithstanding it doth fructifie, not only the Eggs already formed, but those also that shall be formed hereafter.

To the Eggs second Action (which is the Nutrition, and Augmentation of the Chicken) Fabricius calls in the White and Yolk. The Quantity of the yolk and white, saith he, is proportioned to the better performance of the former action, as also to the absolution and just encrease of the chicken. The Egg-shell, and Membranes, are constituted for the safeguard of the whole, and also of the action of the Egg. But the veins, and arteries, which do convey the aliment, are such as without them the encrease and nutrition could not proceed.

But yet he leaves us in suspense, not knowing whether he mean the Umbilical Vessels of the fetus it self, or the veins and arteries of the mother, as those instruments by which the egg is augmented. And yet upon as good ground, both the Uterus, and the Incubation it self, may be reduced into this class.

Come

Come we then to the *Liquors* of the *Egge*, namely the *Yolk* and *White*, for these are, rather than the other parts, instituted for the sake of the *fetus*, and also in them the second action of the *Egge* is most remarkable.

*Hen-eggs* are of two colours, and constituted of two liquors, which are fenced by distinct membranes, and kept apart the one from the other: and likewise, since they are distinguished by a two-fold propagation of *Umbilical Vessels* (whereof the one passeth to the *Yolk*, the other to the *White*) they themselves are in all probability of a different nature, and therefore of a diverse use and advantage. The *Yolk* and *White* of Eggs, saith Aristotle, do obtain a contrary nature; not only in regard of Heat, but Power: for the *Yolk* is condensed by cold, but the *White* is not only not condensed thereby, but liquified the more. So on the contrary, the *White* is condensed by fire, but the *Yolk* is not condensed by it, but continues soft, unless it be very much burned: And is more condensed, and dried by being sodden, then roasted. The *Yolk* being now warmed by Incubation, becomes more moist; for it resembles melted wax, or dissolved fat: whereupon also it fills a larger room than before. For by degrees, as the *fetus* is enlarged, the *White* is consumed and thickened: but the *Yolk* on the contrary, when the *fetus* is now compleat, seems to have lost little or nothing of its dimensions, but seems only to be more liquid and moist, even when the belly of the *fetus* begins now to be covered over with the *Abdomen*.

De gen. an.  
l. 3. c. 2.

And Aristotle gives the reason of this difference: Because a Bird cannot compleat her offspring within her own bowels, she produceth the Aliment also together in the Egg. For in Viviparous creatures the nourishment of the *fetus*, which is called milk, is provided in a di-

fini

strict part of the body; namely, in the Breasts. But Nature hath implanted this aliment in the Eggs of Birds: but yet contrary to the Opinion of most men, and the Assertion of Alcmaeon Crotoniates; for the White is not the Milk of the Egge, but the Yolk. For as the fetus of Viviparous Animals, adhering hitherto to their parent (as the Plant doth to the ground) attract their first aliment from her womb: but after their birth, being then seated without the Uterus; they suck milk from the breast, and so encrease: so the Chicken findes something proportionable to both these aliments in the Egge it self: for as the Uterus of Viviparous Animals is within the parents themselves; so on the contrary, in Oviparous, the parents themselves may be said to be within their Uterus. For an egg is as it were an exposed womb; wherein there is a substance concluded, as the Representative, and Substitute or Vicar of the Breasts. For the Chicken in the egg is first nourished by the White, which being exhausted, it is afterwards sustained by the Yolk, as by Milk. And therefore the Navel or Umbilical propagation, which is derived into the White, when the white is spent, doth fade, and break off before the Chicken is hatcht, leaving no track or relique remaining, but quite vanisheth, before the Lower belly is shut up in the Abdomen (when yet in the race of Viviparous Animals the Navel-string continues still:.) But as for that other propagation of the Umbilical Vessels, which is disseminated into the yolk (when the abdomen is now drawn over the guts) it is, together with the yolk it self, laid up in the belly, & thence attracts nutriment for the tender fetus; till the bill, being now confirmed, & hardned, is able to pick up, and break its meat into pieces, & the Stomack, or Gizzard, be fortified to digest it: As



the production of *Viviparous Animals* is sustained with milk from the *Dug*, till it be provided of teeth, by which it may chew and grind its food. For the Yolk is instead of Milk to the *Chicken*: and therefore a *Hen-egge* (being to supply the office both of the *Womb* and *Breast* or *Udder*) is furnished with a party coloured juice, namely the *Yolk* and *White*.

And as for these two distinct *Liquors* all men living do admit them; But I, as I lately told you, have discovered even two distinct *Whites* in an egg, divided by two distinct *Membranes*, the superior *White* comprehending another within it; just as the *Yolk* is comprehended by the *White*. And these two *Whites* are of a different nature: being reserved in a distinct place, and contained or concluded in a distinct *Membrane*, and therefore designed to a distinct use and intent. And yet both are designed to *Nutrition*: but the exterior is first devoured, as having the propagations of the *Umbilical Vessels* (which are derived to the *Whites*) first disseminated into it, before they pass into the other *White* which is thicker then it: just as those very propagations do first assault both the *Whites*, ere they set upon the *Yolk* which is incompassed by them, and which is reserved for the last nourishment of the *fetus*.

But of this more hereafter, when we come to explain the manner, how the *fetus* of *Viviparous Animals* is formed, & augmented in the *Womb*, and also to demonstrate, that every *fetus* what ever doth derive its original from an *Egge*; and is sustained by a twofold *Albugineous Aliment* in the *Uterus*. For one of these is thinner, and contained within the *Egge* (or *Conception*) it self: the other is attracted and drawn by the *Umbilical Vessels* from the *Cotyledones*, or *Orifices* of the *Vessels* disseminated

ted

Ex.LX. Of the Uses of the Yolk and White. 371

ted into the *After-birth*, and the *Womb*. That substance is contained in the *Conception*: it self, doth resemble the thinner *White*, both in colour, and consistence, for it is *glemy*, *liquid*, and *pellacid*, and very like that substance, which we call the *Colligamentum* in the *Egg*, and in this the *fetus* swims, & is fed by it at the *mouth*. But that which the *fetus* attracts by the aid of his *Umbilical Vessels* from the *Placenta* or *After-burden*, is more thick and mucous, and very like to the thicker *White* of the *egge*. By which it plainly appears, that the *fetus* is no more sustained in the *Womb* by his *mothers blood*, then the sucking *Child* is afterwards nourished by it, or the *Chicken* in the *egge*: but is fed by an *Albugineous Matter*, which is concocted in the *Placenta* or *Cake* of the *Womb*, and doth resemble the *White* of an *EGGE*.

Nor is the contemplation of that divine providence lesse profitable, then wonderful; by which nature both in the *Generation* and *Growth* of the *fetus* (as taking into her consideration their age, and abilities) provides a convenient aliment for each of them, accomodating meats of more easie to some, and of more difficult digestion to others. For as the *fetus* attains a greater strength and ability to digest; so is a grosser and tougher aliment provided for him. And this may be observed even in the diverse kind of *Milk* in *Animals*: for when the *Infant* is new born, the *Mothers Milk* is thinner, and of more facile digestion; but in process of time, and the strength of the *fetus* being now improved, it growes thicker and more coagulated. And therefore those choice and delicate Dames, which do not suckle their *Infants* themselves, are injurious to their *Childrens* welfare; for since mercenary *Nurses* are for the most



part of a ranker constitution, then they : and so have older *Milk*, and more coagulated, and consequently of harder digestion ; it often falls out, that the *Infants* which are born of such Mothers cannot away with the *Milk* of such Nurses (especially about the time of breeding their *Teeth*) but by reason of crudities, or corrupted *Milk*, are tormented with *Feavers*, *Loosness*, *Vomitings*, *Paines* in the *Guts*, *Coughs*, and *Epilepsies*, and the like.

pag. 34. That which *Fabricius* affirms, and indeavours to strengthen with certain arguments : namely, that the *Chalazæ* are the subject matter of the *Chicken*, we have formerly disproved in our History, and have withal made it appear, that the substance and first lineaments of the *chicken* are laid, while the *Chalazæ* are intire, and unaltered : as likewise in a distinct place of the *Egge*.

pag. 54. Nor is it true that the *chalazæ* (which he conceives the cocks seed doth fructifie) do supply the office of seed, that so the *chicken* might be made out of them. Neither do the *chalazæ* so represent the seed, in colour, substance, or propriety of body (as he would have it) or so resemble the picture of a *chicken* in an *egge* that is boiled, that we ought of right to conceive all the spermatical parts to be thence extracted. But we are rather to conceive that the *colliquamentum* mentioned by us, or the thinner part of the *white* resolved, and concocted, doth put on the nature of seed, and supply its place, as our eyes may evidence.

pag. 54. And therefore that contemplation of this reverend sage is too supine, where he saith : Since the whole substance of the *Animal* is constituted of two different, and contrary bodies ; namely, hot, and cold, (all the red and sanguineous parts being hot, as the *Liver*, *Heart*, *Spleen*, *Reins*, *Lungs*, and in short all the



the fleshy, and musculous parts: and on the contrary, all the White and Bloodless, as the Ligaments, Nerves, Bones, Gristles; and all the Membranous parts, as the Stomack, Guts, Womb, the Pericardium, or Purse of the Heart and the like, are cold; these two diverse kind of parts, do, without question, require a diverse, and yet a like Aliment to sustein them; if that position be true, namely, *ex iisdem nutrimur, ex quibus constamus*, we are nourished by the same substances, out of the which we are made. Therefore of right, do the Spermatical cold, and white parts, require a white and cold Aliment; but the Sanguineous, the red, and hot parts, require a red and hot sustenance. And therefore of good right is the White of the Egg, which is cold and bloodless, deputed to nourish the cold, white, and bloodless parts; but the Yolk, as being a hot, red, and sanguineous Liquor, substituted to the hot, and sanguineous. For by this means all the parts of the Animal, may cater and procure for themselves a convenient and familiar nutriment. For we do by no means consent, that the diverse parts of the egge, are ordeined to nourish the diverse parts of the chicken, having formerly shewed, that the Heart, Lungs, Reins, Liver, Muscles, Ligaments, and all the parts of the whole body, do appear white and bloodless at the first.

And upon this argument of Fabricius, it would insue, that the Heart, Lungs, Liver, Spleen, &c. are not Spermatical parts, or constituted out of the Seed: (which he will upon no terms consent to) because they also are afterwards fed, and increased by Blood; for all things are made, and nourished by one and the same thing; because nutrition is onely a substitution of a like substance into the room of that which is lost.

Nor will it less distract him to make answer,

how (when the white is now clean exhausted) the cold, and white parts (namely, the *Ligaments*, *Bones*, *Brain*, *Spinal-Marrow*, &c.) are likewise nourished, and enlarged by the *Yolk*, the *Yolk* being no less a disproportionated aliment to these, then the *White* is to the hot, red, and sanguineous parts.

Nay, according to the fore-cited opinion, the hot, and sanguineous parts are to be the post-genit parts, or born last: that is, the *Flesh* after the *Bones*; the *Liver*, and the *Lungs* after the *Ligaments* and *Guts*: and the cold parts of the *body* are to be upon the *Forge* all the while the *White* is consuming; and after them the *hot*, when the *Yolk* begins to decline and wash it self away to supply their growth: so that all the parts could not possibly arise out of the same *Whites*. But all these matters are confuted by ocular experiment.

To confirm this: the *Egges*, or *Spawn* of *Cartilaginous Fishes* (namely, the *Ray*, the *Fork-fish*, and the *Dog-fish*) are partly coloured, and have a well complexioned *Yolk*; and yet all the parts of those very fishes (even the *Parenchyma* of the *Liver* it self) appears *white*, *cold*, and *bloodless*. And on the contrary, I have seen a race of *Hens* and *Cocks*, which are of a large stature, their *feathers* blackish, their *flesh* full of *blood*, and their *Liver* more ruddy then ordinary; and yet their *egges*, even the fertile ones, have exceeding pale *Yolks*, of no deeper a yellow then the straw of ripe *Barly*.

pag. 55.

*Fabricius* in the subsequent words, seems to retract his former speeches: saying, *But one thing is very wonderful both in the Yolk and White; that neither of them being blood, yet they are so neer of kin to blood, that they are but little different from it, and a small*

a small matter keeps them from being very blood it selfe : and therefore a little paines, and a slender concoction sufficeth to convert them into blood. And this is the reason why we alwaies discover those Veins and Arteries which are propagated into the membranes of the Tolk and White to be full of blood ; and yet the Tolk and White abide still in their own nature : but so soon as either of the two is attracted into the Vessels, it presently transforms into blood ; so neer allyed are they to blood.

Now if it is most certain, that blood is no less contained in those propagations of the Veins which are disseminated into the White, then in those that are derived into the Tolk : and each of these Liquors is so neerly related to blood, that a very smal matter will procure their transmigration into it; who will deny, that the blood, and consequently all the Sanguineous parts are as well nourished and enlarged by the White, as by the Tolk.

Hereupon Fabricius provides for his retreat : <sup>Ibid.</sup> saying, Though all this be true, yet we are to conceive, that this substance, which is attracted from the Tolk and White by the Veins, is blood in that maner only, as Chyle is in the Meseraick Veins ; in which there is nothing discoverable but meer blood ; whereas the Chyle bath onely received the shadow of blood, and is to be compleated in the Liver ; so that substance attracted by the Veins out of the Tolk and White, presently puts on the shadow and resemblance of blood, &c. Well, be it so : yet though he lurk in this shadow, he doth not salve the doubt, which is, why the Blood, and sanguineous parts may not, for the fore-cited reasons, be as well nourished by the White as the Tolk.

If he had said, that the hotter parts, are rather



nourished by that *blood* (or Aliment contained in the *blood*, which is proportionable to the *Chyle*) which is attracted out of the *Yolk*, then out of the *White*: and so on the contrary, that the cold parts are supplied rather by that Nutriment which the Veins transport from the *White*, then from the *Yolk*, I should not have much opposed him.

The main thing that disturbs him in this business, is this, how the *Blood* can be made in the *Egge*; or what Artificer can transform the two Liquors into *blood*, when there is yet no *Liver* in Being? For he could not say that the *blood* in the *Egge* is derived from the *Mothers blood*. But saith, *This blood is rather wrought in the Veins then in the Liver*: but it becomes a *bone*, a *gristle*, or *flesh*, &c. in the parts themselves, where it is exactly concocted, and assimilated, without any farther addition at all; not signifying by whom the *blood* which is in the Veins dispersed both into the *Yolk* and *White*, is concocted, elaborated, and made perfect, when as yet no *Liver* at all is extant, or any particle of the *body*, that might concoct or compleat it. And when he had formerly said, that the cold parts are nourished by the *White*, the hot by the *Yolk*; not mindful of his assertion, he here concludes the quite contrary, viz. that the same *blood* doth transmigrate into *bones*, *gristles*, *flesh*, and other parts.

But he lets that grand difficulty, which so much disquiets the Physicians minds, glide by in silence, without taking any knowledge of it: namely, how the *Liver* can be the *Original* and *Author* of the *blood*: seeing that *blood* is not onely found in the *egge*, before any one of the *bowels* are framed at all: but Physicians themselves do teach, that

Ex. LX. Of the Uses of the Yolk and White.

377

that all the substance or *Parenchyma* of the bowels themselves, are meerly so many affusions, or confluxes of blood. Is the Effect, the Author of its own Efficient? If the *Parenchyma* of the Liver is made of blood, how can the Liver be the cause of blood?

And the insuing passages are of the same batch, where he saith: *There is also another use of the White, when it is now segregated from the Yolk: namely, that the fetus may swimme in it, and so be sustained, lest tending downwards by his own weight, hee might incline to one part rather then another, and so drawing the Vessels along with him, might break them in sunder: and to this use the purity and tenacity of the White do conduce. For if the fetus should take up his residence in the Yolk, he would easily descend down into the bottome, and so disorder and break the Yolk also.*

A very weak construction this! For what doth the purity of the *White* avails to the sustentation of the Chicken? Or how can the *White* which is more thin, better support the Chicken, then the *Yolk* which is thicker and more gross then it? Or what danger is there, that the Chicken should fall down? Since the *eggs* in Incubation lies always side-long, so that there is no fear of ascent, or falling down. True it is, indeed, that not only the Chicken, but every *fetus* whatsoever (while it is forming) doth swim: but that innatation is in the *Colliquamentum* spoken of by us, and not in the *Yolk* or *White*: and we have rendered the reason thereof elsewhere.

*Aristotle* (saith he) Writes, that when the Chicken is conceived, the *Yolk* ascends to the Obtuse Angle of the *EGGE*, and the reason is, because the Chicken is formed out of the *Chalaza*, which adbereth to the *Yolk*; whereupon it behooves the *Yolk*, which is placed

placed in the middle to mount up to the larger part of the Egge; that so the Chicken may be there made, where there is a natural cavity, very necessary to the welfare of the Chicken. But the Chalaza is more fastened to the White, then to the Yolk,

But the reason of that ascent of the Yolk is this; the *Macula* or little *cicatrice* which appears in the coat of the Yolk, is by reason of the spirituous *colliquamentum* which is bred in it, dilated; and thereupon requiring more roome, doth tend towards the Obtuse Angle of the Egge: and so likewise that portion of the Yolk and White which is melted, is distended, and being now grown more concocted and spirituous, doth swimme upon the other parts that remaine crude: as those parts of water which are warmed in any vessels, arise from the bottome up to the top: an experiment approved by all Physicians, who holding the *Urina*l containing a thick and troubled *Urine* in warm water, do perceive the upper part thereof, to clear and grow transparent first. This following Instance will explain the matter. There is a device known to most men, which is intended rather for a jocular bable to gaze upon and laugh at, then for any useful implement; namely, a certain Glass-globe, which is almost filled up with clear water, wherein several Glass-balls which are fraught with nothing but Air, do swim upon the surface of that water, which by reason of their levity do support several figures (Of quivered *Cupids*, armed *Centaures*, Chariots of the *Sun*, and the like) which else would all sink down to the bottom. So in like manner, this *Oculus pulli*, this Eye of the Chicken as I terme it, or first *Colliquation*, being dilated by the heat of the *Sitting-Hen*, and the Genital vertue in the Egge, and so made lighter,



Ex. LXI. Of the Uses of the rest of the Egge. 379

lighter, ascends to the top, and draws up the Yolk to which it adheres together with it. Hereupon the thicker *White* gives place to it, and the *Chalazæ* retire to the sides of the Egge, because the *Cicatricula*, which was formerly situate in the side of the egge, now mounteth directly upward.

Of the Uses of the other parts  
of the Egge.

EXER. LXI.

**T**He *Shell* is hard and thick, that so it may fence the Liquors, and the Chicken which dwells in them, from outward injuries. But yet it is brittle, and especially in the *Obtuse end*, and neer the time of the exclusion of the *Chicken*, lest it might obstruct the Chickens Exit. This *Shell* is also porous, for while an egge (especially a new-laid one) is in roasting before the fire, it doth breath out a kind of sweat, trickling down, as it were, drop by drop. Now these pores are useful for *Ventilation*, as also for the more easie penetration of the heat which results from the *Sitting Hen*; and likewise that the Chicken may attract aire from without: for as we have said before, the *chicken* doth, without all question, both breath, and cry before his exclusion.

The *Membranes* serve to contain the *Liquors*, and therefore they are as many in number, as the liquors are. And the *Colliquamentum* also, so soon

as it is in being, is presently invested in its owne proper tunicle: as *Aristotle* did imply in these words. *A membrane also, variegated with sanguineous fibres, doth now incompass the white Liquor, &c.* But now when the exclusion of the *Pullus* is at hand, and the *White* and *Colliquamentum* are exhausted, all the *Membranes* (excepting onely that which embraceth the *Yolk*) are dried away, and vanish: but that *membrane* is together with the *Yolk* drawn into the *Peritoneum*, and concluded in the lower Belly. Now of these *membranes*, two are common to the whole eggs, which they do immediately comprehend next under the *Shell*; but the other are proper *membranes*, relating to the *White*, the *Yolk*, and the *Colliquamentum*: but they all of them serve to the preservation, and distinction of those parts which they embrace. Of the two *Common coats*, the exterior which doth stick to the *Shell*, is the tighter, that so it may not suffer violence by the neighbourhood of the *Shell*, but the interior is smooth and soft, that so it may not prejudice the *Liquors*, as the *Meninges* or *membranes* called *dura* and *pia mater*, do defend the *Braine*, from the roughness of the *Scull*. The interior, and proper *membranes* do, (as I have said) embrace, and distinguish the *Liquors*: whereupon they are very thinne, transparent and fraile.

*Fabricius* doth indeed highly extoll the *Chalazæ*, (as those parts out of which he conceived the *Chicken* was framed) but as for the *Macula*, or little *Cicatrice*, which is bred adhering to the tunicle of the *yolk*; he concludes it to be a useles thing, esteeming it to be no more then a bare relique or remainder of the stalk broken off from the *Vitellary*, or superiour *Uterus* of the *Hen*. For (according to his perswasion) the *yolk* did formerly

Ex. LXI.  
ly attr  
Vessels p  
no long  
from  
of the to  
red ther  
But I  
no other  
formerly  
as the P  
connecti  
ther, wh  
each in  
and con  
ther. B  
that it is  
of all; as  
in the I  
which, a  
lighted  
quors; an  
ted, and  
Here  
deeming  
the rema  
afterwar  
covered  
nexed i  
vity of t  
and Plan  
the conn  
had upo  
that the  
the Clus  
(Like a

Ex.LXI. Of the Uses of the rest of the Egge. 381

ly attract its sustenance through that *stalk*, or the *Vessels* passing through it; but the *yolk* being now no longer nourished by the *Hen*, but disjoined from the *Ovary*, there still continues a sign or track of the former conjunction, and the benefits received thereby.

But I on the contrary apprehend, that there is no other use of the *Chalazæ*, beyond that which I formerly observed; namely, that they should be as the *Poles* of that *Microcosme*, and the ends or connexions of all the *membranes* wound up together, whereby the *liquors* are not onely continued each in their proper places, but also retain a just and convenient position in relation to one another. But as for the fore-said *Macula*, I am certain, that it is of the greatest concern and consequence of all; as being the chief Center of the *Egg*, wherein the *Innate heat* hovers and lurks, and out of which, as out of the first spark, the *soul* her self is lighted; and lastly, for whose sake, all the *liquors*, and their respective coverings are constituted, and made.

Heretofore, indeed, I was of *Fabricius* his mind, deeming this little *Cicatrice* to be nothing else but the remainder or track of the stalk broken of; but afterwards, upon more accurate observation, I discovered, that the stalk, whereunto the *yolk* is annexed, is not inserted into any little cranny or cavity of the *yolk* (as it is with the stalks of *Apples*, and *Plumms*) and that so some track or print of the connexion or dependance which the *yolk* once had upon the *Ovary*, should continue in it; but that the stalk, before it arrives to the *Yolk* from the *Cluster*, is all the way dilated into a round, (like a little trumpet) that so it may encompass the



the horizon, or the circle of the Yolk, which divides it into two parts; (as the *Tunica Amphiblestroides*, or tunicle which resembleth a litle round Casting-Net, doth the Egg) so that the superiour part of the Yolk, or Hemisphere, which looketh towards the Cluster, is quite free from any contact or coherence of the stalk, & yet the fore-mentioned *Macula*, or litle *Cicatrice*, is seated upon the superiour part of that litle cup, or portion of the membrane of the Yolk; (something inclining towards the side) so that this *Macula* can upon no terms be said to be the print of the stalk broken off from the Yolk. But of how great importance this *macula* is in the generation of the Chicken, hath already been discovered in our *History*.

It now remains, that following the steps of *Fabricius*, who was formerly my Tutor, and is now my Guide, I should declare the uses of that *Cavity* which is in the *obtusè part* of the Egge.

*Fabricius* recounts several conveniences arising from it, according to its several magnitude: which I shall declare in short, saying, It contains aire in it, and is therefore commodious to the *Ventilation* of the Egge, to the *Respiration*, *Transpiration*, and *Refrigeration*, and lastly to the *Vociferation* of the Chicken. Whereupon, that *Cavity* is at the first very litle, afterwards greater, and at last greatest of all, according as the several recited uses do require.

And thus farre have we discoursed, concerning the Generation of the Egge and Chicken, and the Uses of all the parts of the Egge; according to which discourse, we are to conclude and give judgment concerning all kinds of *Oviparous productions*. We are now to declare the manner of the Generation of *Viviparous animals*, according to the

Ex. LXII. *That an Egg is the Common, &c.* 383

the example and pattern of the Generation of some one *Viviparous Animal* which is perfectly known, and discovered, by us.

*That an Egg is the Common Original of all Animals.*

E X E R. LXII.

**A** Nimals, saith Aristotle, have this in common together with Plants; that some do spring out of seed, and some of their own accord: for as Plants do either arise from the seed of other Plants, or else spring up of their own accord, having attained some principle fit for their production: and some of them do attract aliment to themselves out of the earth, and some again are bred in other plants: so some Animals are generated by the cognation or affinity of their form; and some of their own accord, no seed at all proceeding which is of kin to them: whereof some are generated out of putrefied earth or plants, (as several Insects) others are begotten in Animals themselves, and out of the excrements of their parts. But this is common to all those (whether they be generated of their own accord, or else in other Animals, or out of the putrefaction of their parts, or their excrements) namely, to arise out of some principle fit for that purpose, and by some efficient contained in that principle: so that All living creatures must of necessity have a principle out of which, and by which they are begotten. Give me leave to call this principle, *Primordium vegetale*, the vegetal principle; namely,



namely, some corporeal substance, having life in it in *potentiâ*, or something subsisting of it selfe, which is apt to be transformed into a *vegetative form*, by some internal principle acting in it: Namely, such a principle as the *Egge*, and the seed of *Plants* is: such is the conception of *Viviparous Animals*, and the *Worm* of *Insects*, as *Aristotle* calls it: the principles of divers *Animals* being also diverse, according to the diversitie of which principles, the manner of the generation of *Animals* is diverse likewise: and yet they all consent and agree in this, that they spring from a *vegetal principle*, as out of a matter indowed with an efficient or productive virtue; but differ, in that this principle doth either result casually, or of its own accord, or else proceed from something pre-existent, (as the fruit thereof.) Whereupon those *Animals* are called *sponte nascentia*, spontaneous productions, these à *parentibus genita*, offsprings derived from their parents. They are also distinguished from their manner of *Birth*; for some of them are *Oviparous*, others *Viviparous*: to which *Aristotle* addeth *Vermiparous*. But if we may distinguish them, as they fall under sense, there are onely two *Species* or sorts of productions; namely, these: all *Animals* do either produce an *Animal Actû*, actually; or *potentiâ*, potentially. Those *Animals* which produce an *Animal actû*, are called *Viviparous*; and those that produce an *Animal in potentiâ*, *Oviparous*. For every principle which is only alive in *potentiâ*, we (with *Fabricius*) do conceive, ought to be called *Ovum*, an *Egge*: and as for that principle which *Aristotle* calls *Vermis*, a *Worm*, we do not at all distinguish it *ab Ovo*, from an *Egg*; and that because it looks like one to the eye, and also because that indistinction seems consonant to reason.

Hist. an. l.  
l. c. 5.



son. For that *Vegetal Principle*, which is alive in *potentiâ*, is also an *Animal in potentiâ*. Nor is that distinction which *Aristotle* puts between an *EGGE*, and a *Worm*, to be allowed of; for he calls that an *EGGE*, *ex cuius parte fit Animal*, out of part of which an *Animal* is made: *quod autem totum mutatur, nec ex parte ejus Animal gignitur, est Vermis*: and that a *Worm*, which is wholly transformed, and doth not produce an *Animal* out of some part of it only. But now these two do both agree in this, that they are productions not yet alive, but *Animals onely in potentiâ*; and therefore are both *Eggs*.

And *Aristotle* himself calls the very same things *Worms* in one place, and *Eggs* in another: And treating of *Locusts*, saith, *There eggs are corrupted in Autumn, when it is wet weather*: and (speaking of *Grasshoppers*) *When the little worm, groweth in the ground, it becomes Tettigometra, a Grasshopper-matrix*: and a litle after, *The females taste the sweeter after coition; for they have white eggs*. Nay, in that very place, where he had raised a distinction between a *Worm* and an *EGGE*, hee adds; But all this kinde of little worms, when it hath attained the end of its magnitude, is made a kinde of *EGGE*; for their shell doth harden, and so long they continue without motion; which is apparent in the worms of *Bees*, and *Wasps*, and also in the *Canker-worm*. And indeed every body may see, that the first rudiments of *Spiders*, *Silkworms*, and other *Insects*, are to be no less ranked in the classis and scale of *Eggs*, then the *spawn*, or *Eggs* of *Fishes* which have softer shells, or of *Fishes* which have no shells at all, and almost of all sort of *fishes* whatsoever: which *Spawn* of theirs is not actually an *animate body*, but yet *Animals* are begotten out of them. Since

therefore those creatures which do produce *actu Animal*, a Creature actually alive, are called *Viviparous*: doubtless, those *Animals* which do bring forth a creature which is alive *in potentia*, must be called *Oviparous Animals*, or else they cannot be comprehended under any *Common notion*; especially, seeing such Productions are *vegetal Rudiments*, proportionable to the *seeds of Plants*, such as an *egge* also is allowed to be. We must therefore conclude, that all *Animals* are either *Viviparous*, or *Oviparous*.

But because there are several *species of Oviparous Animals*, therefore the difference of Eggs is also several. For any kinde of *Rudiment* is not a competent Recipient of every kinde of *animal form*. Though therefore Eggs in a large or general acceptation do not differ, yet since some are *perfect*, and some *imperfect*, they are justly distinguished. *Perfect Eggs* we call those, which are perfected in the *Uterus*, and obtain there a requisite magnitude, before they are layed: as the *Eggs of Fowle*. But those we call *Imperfect*, which are excluded ere they are ripe, and have not yet attained their just bulk, but do expect that abroad, after they are layed; as the *Spawn* or Eggs of *Fishes*, that have a softer shell, and of *Fishes* which have none at all; and likewise the *Rudiments of Insects* (which *Aristotle* calls *Worms*) are to be listed in this rank: as also the *Rudiments of those Creatures* which are spontaneous productions.

Moreover, though some kindes of *perfect Eggs* are party-coloured, as being compounded of a *yolk* and *white*; yet some of them are only of one single colour, as constituted of a *white* alone: so also amongst *imperfect Eggs*, others are properly so called, as out of which a *perfect Animal* is produced,



duced, as out of the Egges of Fishes : and others improperly, from whence an imperfect Animal proceeds ; namely, a Worm, or Canker-worm ; which is a kinde of Medium between a perfect, and an imperfect Egge : which in respect or comparison of its own egge, or Rudiment from whence it sprung, is an Animal indowed with Sense and Motion, and doth nourish it self ; but in comparison of a Flye, or Butterflie, whose rudiment is in potentia, it is to be counted no better then a crawling-egge, sustaining it selfe : like to a Canker-worm, which having now attained its perfect magnitude, is transformed into an Aurelia, or perfect Egge ; and now ceasing to move any longer, like a very Egge indeed, is an Animal in potentia.

In like manner, though there are some Eggs, out of whose whole and entire substance (by a Metamorphosis, or Transformation) a perfect Animal is formed, which is not fed by any remaining portion of the Egge, but instantly seeks out for its maintenance abroad : and other Eggs, out of part of which a Fetus is constituted, and nourished by the remainder ; though (I say) there are so many several sorts and diversities of Eggs, yet nothing stands in the way, to forbid those to be called Eggs, which Aristotle styles Worms, (if we may give judgement upon things, according as they discover themselves to our sense and reason) since they are all Vegetal principles, not actually Animals, but in potentia, & the true seeds of Animals, proportionable to the seeds of Plants ; as we have long since demonstrated in a Hen-egg. All Animals therefore, are Viviparous, or Oviparous ; because they either produce an Animal actually alive, or else an Egge, or Rudiment, which is an Animal, not actu, but in potentia.



The Generation therefore of all *Oviparous Animals* may be reduced to the example of *Hen-eggs*, or at least be easily deduced from thence: because the same things which are related in their history, may be discovered in the rest of *Viviparous creatures*.

But hereafter, when we treat of the Generation of *Insects*, and of *Spontaneous productions*, we shall discover how each of them are either differenced amongst themselves, or do else agree. For since every generation is a path-way to the attaining of the form of every *Animal*: according as *Animals* are either like, or unlike one another, so that their parts do neither specifically, nor generically agree; so likewise is it usuall in their *Generations*. For Nature, who is a *Perfect Operatrix*, and consonant to her self in her Operations, doth design *Parts* that are alike, to *Operations* and *Functions* that are alike and agree; and so likewise to the attainment of the same form, and the same end, she treads the same steps, and persists alwaies in the same method in the Generation of *Animals*.

Hercupon, in every perfect party-coloured egge of any fowle whatever (which is compounded of a *Yolk* and *White*, and fenced with a *Shell*) as we have still observed the same parts, as are in a *Hen-egg*, so have we ever found the same order and method of generating, and constituting the *fetus* (as in a *Hen-egg*.) And the self same things may also be observed in the Eggs of *Serpents*, and all *Oviparous four-footed Animals*, as the *Tortoise*, *Froggs*, and *Lizards*; as from whose perfect and party-coloured egges, the *fetus* is framed and produced, the same way, as in others of the like kinde. But how *Spiders*, and the softer *Shell-fish*, as *Lobsters*, and *Shrimps*, and the race of *Fishes* that have *scales* and

no shells, as the *Cuttle-fish* and the *Calamire* do get out of their Eggs, or *Spawn*; as also how *Worms*, and *Catterpillars* do first creep out of the Eggs of *Insects*, out of which, at length retreating into the worm or vermine called *Aurelia*, (as into other new eggs again) at last a common *Flie*, or *Butter-flie* is generated; how these Creatures, I say, doe differ in their Generation out of Eggs, from the brood arising out of *Hen-eggs*, shall be declared in its due place.

Lastly, though all party-coloured eggs are not generated and fructified the same way; but some become *prolific* by the Coition of a Male and Female, and others by other meanes, as the *egges* or *frie* of *Fishes*; and though there be also a difference in the manner of the growth of *Egges*, inso-much as some are nourished and encreased within their parents bowels, and others abroad: yet nothing hinders, why a *fetus* may not be produced out of any *egge* whatsoever, (in case it be a perfect *egge*) as well as out of a *Hen-egge*. Wherefore, the *History* wherein we have already unfolded the generation of a *Hen-egge*, is satisfactory and full enough for the knowledge of the Generation of all other *Oviparous* creatures beside; as likewise to the knowledge of all those things which doe thence ensue, by way of Corollary, or Deduction.

## Of the Generation of Viviparous Animals.

### EXER. LXIII.

**T**HUS farre have we proceeded in the *Generation of Oviparous Animals*; it follows, that we now produce our Observations, concerning the other *species* of *Viviparous* productions: wherein we have found very many things which are altogether the same with those which occur in the *Egge*; which we have reduced hither to be consulted, and come last to be delivered. Which, though they are paradoxical, and run counter to the common received tenets, yet are they, if my judgment fail me not, entirely consonant to the Truth.

Amongst *Viviparous Animals*, Man is the chief, and most perfect of all: next him (that we may proceed from such as are more known) are ranked those creatures that are more sociable & obvious: (whereof some are *solidipeda*, whole-hoofed; as the *Horse*, and *Ass*: some are *Bifulca*, cloven footed; as the *Oxe*, the *Goat*, the *Sheep*, the *Hogg*, and the *Deer*: others *fissipeda*, five *digitatis pedibus*, Creatures whose feet are distinguished into *Toes*; as the *Dog*, the *Cat*, the *Cony*, the *Mouse*, and the like; out of the manner of whose generation, we may conclude concerning the generation of all other *Viviparous Animals*. Wherefore, (as we have done in the *History* of the *Egge*, so) we shall single out some one kinde of these, as an *Exemplar* or *Representative* of all the rest; which, as being most known to us, will give light to the rest, and become



become a platform, to which all the other may be reduced, by way of *Analogy*.

I have already given you the reason, why I have drawn out documents concerning all other *Egges*, from the *Egges* of *Hens*: namely because those are cheap, and every mans purchase; and upon that score we our selves had the advantage to make the more diligent disquisition, and others also have the better opportunity to experiment the truth of our doctrine.

But there is more difficulty in the search into the *Generation of Viviparous Animals*: for we are almost quite debarred of dissecting the humane *Uterus*: and to make any inquiry concerning this matter, in *Horses*, *Oxen*, *Goats*, and other *Cattel*, cannot be without a great deal of paines and expense. But those who are desirous to make tryal, whether we deliver truth, or not, may assay the business, in *Dogs*, *Conies*, *Cats*, and the like.

*Fabricius ab Aquapendente*, as if every *Viviparous* conception were a kind of egge, begins his Tract with that; (as being the general exemplar of *Generation*) giving this amongst other, as the chief ground of his proceedings; namely, because the contemplation of the egge, is of the largest extent: for the greatest part of *Animals*, saith he, is generated out of *Egges*. But we in the entrance of these our Observations, have concluded that all *Animals* are in some sort produced out of an *Egg*: For the *fetus* of *Viviparous* creatures is produced after the same manner and order out of a pre-existent conception, as the *Chicken* is formed and constituted out of an *Egge*: There being one and the same species of generation in them all, and the *exordium* or first principle of them all is either called an *egge*, or at least something answerable and proportionable.

De form.  
Ovi &  
Pulli, c. I.

portionable to it. For an *EGGE* is an exposed conception from which a *CHICKEN* is produced; but a conception is an *EGGE* retained within, untill the *FETUS* have attained its just bulk, and magnitude: in other matters it squares with an *EGGE*: for they both are *Vegetal rudiments*, and also *Animals in potentia*. Wherefore the same *Theorems*, and *Corollaries*, (though contrary to the received perswasion) which we have already inferred in the *History* of the *EGGE*, are most true: Likewise of the generation of all kind of *Animals*. For it is a confessed and plain thing, that all *FETUSES*, even humane ones also, are procreated out of some conception, (or certain ground-work.) And this is also as true: that that thing which is called *Primordium*, the first rudiment in spontaneous productions, *semen*, the seed in *Plants*, and *Ovum* the *EGGE*, in *Oviparous* (as being that corporeal substance, out of which moving and operating by an intrinsecal principle, that which is produced is either a *Plant* or an *Animal*: ) that same thing in the Generation of *Viviparous Animals* is *conceptus primus*; the first Conception: and this is approved to be true both by sense and reason.

What we have formerly affirmed of the *EGGE*, namely, that it is the *sperme* and seed of *Animals*, proportionable to the seed of *Plants*: the same do we now pronounce of the conception, which is the real seed of *Animals*, and therefore also called *AN EGGE*. For that is true seed according to *Aristotle*, which takes its Original from two *Animals* joined in coition; and obtains the virtue or power from both *Sexes*; such is the seed of all *Plants*, and of some *Animals* which know no distinction of *Sexes*: as it were that which is first mixed from *Male* and *Female*, being a kind of promiscuous conception, or *Animal*:

De gen. an.  
l. i. c. 18.

*mal*: for these creatures have that in themselves alone, which is required of both Sexes: namely, a fit matter to feed the *fetus*, and also a *plastical*, or *formative*, and *operative* vertue able to produce it. So in like manner, the *conception* is the fruit of the *Male*, and *Female* joined in *coition*, and also the *seed* of the future *fetus*; wherefore it differeth not from an *egg*.

But that, which proceeding from the *Generant*, is the cause which first obtains the principle of *Generation* (*viz.* the *Efficient*) ought to be called the *Geniture*, but not the *seed* (as it is miscalled by the common people, and *Philosophers* too at this day) because it hath not in it that thing which is required of two in *coition*, neither is it proportionable to the *Seed* of *Plants*. But whatsoever doth possess the fore said condition, and is answerable to the *Seed* of *Plants*, that also doth deserve to be called an *Egge*, and a *Conception*. Ibid.

Also the definition of an *Egge*, delivered by *Aristotle* doth fully square to it: saying, *An Egge is that thing in perfect productions of part whereof an Animal is made, and sustained by the remainder, after it is made.* Hist. an. l. 1. c. 5. Now the same things agree to a *Conception*, as shall afterwards appear by the dissection of *Viviparous Animals*, our *Eyes* themselves being witnesses thereunto.

Besides, as a *Chicken* is hatched out of an *Egge*, by the fostering heat of the *Sitting Hen*, or some other asceticious hospitable patronage, so also the *Fetus* is produced out of the *conception* in the *egge*, by the soft and most natural warmth of the parent.

In a word: that which *Oviparous Animals* afford by *Incubation*, or gathering under their *Wings* and *Breast*; that is exhibited by *Viviparous*, by the *Womb*,



*Womb*; and neereſt, or inward embraces. And then, concerning that which relates to procreation, the *fætus* is produced out of the *Conception*, in the ſelfe ſame manner, and order, as the *Chicken* out of the *Egg*; With this onely difference, that in an *egge*, whatſoever relates to the Conſtitution and Nutrition of the *Chicken*, is at once contained in it: but the conception (after the *fætus* is now formed out of it) doth attract more nourishment out of his Parents *Womb*; whereupon the nourishment increaſes with the *fætus*. Moreover the *Egge* is quite emptied, when the *Chicken* is grown; and the Aliment which was in it conſumed, nor doth the *Chicken* attract any more ſuſtenance from the *Hen*: but the *Oviparous Fætus* doth ſtill finde out freſh ſupplies, and ſuſteineth it ſelf by *Milk*.

Now the *Eggs*, or *Spawn* of *Fishes* are ſupported by food procured from without; the *Egges* of *Inſects* alſo, whether they have ſhells or not, have their proviſions from abroad, nor are they leſſe *eggs* for that, either really, or nominally: ſo in like manner the *Conceptum* deſerves the title of an *Egge*, though it be ſuſtained by a various kind of Aliment from without.

Why ſome *Animals* are *Oviparous*, and all do not produce their *Fætus* alive, *Fabricius* offers this reaſon: namely, becauſe *egges* (if they were detained in the *Uterus* till the *Pullus* were hatched) would by their weight prejudice the flight of *Birds*. And alſo in *Serpents*, or creeping things the multitude of *egges* would be an impediment to their winding motions. Nor is there compaſſ enough in the narrow circuit of the *Snail's ſhell*, to afford room to the number & increaſe of *eggs*. So likewiſe the *Fishes* bellies are too ſcanty to contain

Ex.LXIII. of Viviparous Animals.

395

contain their numerous Fry, should they grow within them. And therefore these several creatures are enforced to exclude their births, ere they arrive to perfection. So that it seems most natural for an *Animal*, to contain and cherish its conception within it self, untill the *fetus* be quite perfected : but nature is sometimes constrained to expose her issues immature, and imperfect, and to compleat them with provisions sought for from without.

For as much therefore as concerns procreation, All kind of *Animals* are generated after the same manner out of an *Egge-like Rudiment* : (which we call *Egg-like*, not that every *Rudiment* of an *Animal* doth resemble an *Egge* in Figure, but in Nature and Consistence) For in all their respective *Generations* this they have in common, namely, that a certain *Vegetal principle* is pre-existent (of like nature to an *Egge*, and answering in proportion to the *Seed* of *Plants*) out of which the *fetus* is produced. And this *Egg* or *Egg-like* substance is in them all, possessing the nature and conditions required in an *Egg* : which conditions also the seeds of *Plants* have common to them, as well as *Animals*. And for that cause the principles of any kind of *Animals*, are called their *Fruits*, and *Seeds*, and so likewise the *Seeds* of all *Plants* may in a manner be called *Egges*, and *Conceptions*.

And to this purpose *Aristotle* speaks, saying : De gen.an.  
Those creatures which bring forth an *Animal* from l.3.c.9.  
within themselves, have something formed in them upon the first conception like unto an *egge* : for they have an humour contained in a thin coat, such as that in an *egge* when the shell is pilled off. Whereupon those depravations of conceptions which fall out about that time,

time; fluxus vocant, the people call, Fluxes, or miscarriages.

Those Fluxes are chiefly observable in Women, when they miscarry in the first or second moneth: and such I have often seen discharged about those times: and such a one also Hippocrates reports to have been discharged, and fallen from the Minstrel.

Hist. an. l.  
7. c. 7.

The first Conception, or Rudiment therefore of all Animals is in the Uterus: which according to Aristotle, is like an egg covered over with a membrane when the shell is pilled off. And this shall appear more clearly by what shall be said hereafter. In the interim we conclude with the Philosopher: All Animals, whether they be swimming, walking, or flying Animals; and whether they be born in the form of an Animal, or of an Egge: are all generated after the same manner.

---

The History of the Generation of Hinds and Does, is layed down as the Example of all other Animals: together with the reason of our so doing.

#### EXERCIT. LXIV.

Our late Sovereign King Charles, so soon as he became a Man, was wont for Recreation, and Health sake, to hunt almost every week, especially



ally the *Buck* and *Doe*; no Prince in *Europe* having greater store either wandering at liberty in the Woods, or Forreſts, or incloſed and kept up in Parkes and Chaces. In the three ſummer moneths, the *Buck* and *Stagge*, being then fat and in ſeaſon, were his game, and the *Doe* and *Hind* in the *Autumne*, and *Winter*, ſo long as the three ſeaſonable moneths continued. Hereupon (for the *Rutting time*, when the *Females* are luſty, and admit the *Males*, whereby they conceive and bear their young) I had a daily opportunity of diſſecting them, and of making inſpection and obſervation of all their parts; which liberty I chiefly made uſe of in order to the *Genital parts*.

We ſhall therefore diſcloſe the *Generation* of all *Viviparous Animals*, out of the *History* of the *Hind* and *Doe*, as being the moſt commodious Exemplar: treating thereof after the ſame manner as we have already handled the *Generation* of all *Oviparous productions*, out of the *History* of the *Hen-Egge*. And this not from any peculiar deſign of my own, or for the ſame cauſes for which I did prefer the *Hen-Egge* to all other: but becauſe by the favour and bounty of my Royal Maſter (whoſe Phyſician I was, and who was himſelf much delighted in this kind of curioſity, being many times pleaſed to be an eye witneſs, and to aſſert my new inventions.) I had great ſtore of his *Deere* at my devotion, and frequent opportunity and liſenſe to diſſect and ſearch into them.

I intend therefore to ſet before you the *History* of *Hinds* and *Does*, compoſed out of my ſundry obſervations for many years together, whereby I my ſelf am chiefly verſed in them, and from whence alſo ſomething may be infallibly concluded concerning the *Generation* of other *Viviparous*

*rous Animals* : which *History*, whilst we faithfully compile, we shall also insert all those observable Occurrences, which we have either casually met withall, or else attained by intended dissections in other *Animals* ; namely, such as are cloven-footed, whole-boofed, and those which have their feet distinguished into toes, as likewise in *Man* himself : declaring the *series*, or order of the Formation of the *Fætus*, according to the several proceedings which Nature her selfe doth observe therein.

### *Of the Uterus of Hindes and Does.*

#### EXER. LXV.

BEING about to treat of the Formation and Generation of the *Hinde* and *Doe*, we must first discourse concerning the place wherein those actions are performed, namely the *Uterus* ; (as we have already done in the *History of the Hen*) that so those things which ensue, may be more easily and rightly understood. For in this very thing, *History* hath the precedence of *Romance* and *Fable*, namely, in that she describes events with their just circumstance of set times and places, and so guides us unto knowledge by a surer way.

But that we may the better conceive the *Deere's Uterus*, we shall explain both the *internal*, and *external* fabrick thereof, taking our pattern from the womb of *Women*. For *Man*, who is the most consummate or complete *Animal* of all other, as he hath obtained all other parts more perfect then they

EX. LXV. Of the Uterus of *Hindes & Does*. 399

they, so are his *Genital parts* also. And therefore the *Uterine parts* are most distinct in a *Woman*, and to us (by reason of the special industry of *Anatomists* about this *Part*) better known.

Now in the *Uterus of Hinds, & Does*, many things do occur which you may discover to be the same in the *womb* of a *Woman*; but yet some things do differ. In the *external orifice*, are neither the *labra*, nor the *Clitoris*, nor the *Nympha*; but onely two *Orifices* (whereof one is the *Orifice* of the *Bladder*, adjoined to the *Share-bone*; the other of the *Privy*, seated between the *fundament* and the *Urinary cavity*.) The membranous *Cuticle* (like to that which we have noted in a *Henne*) tending downwards from the *fundament*, doth cover the *veil*, and supply the office of the *Nympha & labia* of the *Privy*, in order to its defence from outward injuries: this *veile* is something retracted in a *Woman* in *coition*, or at least forced to retreat by the entrance of the *Yard* into the *Orifice* of the *Privy*.

The *Suture* or connexion of the *Share-bones* being divided in *Hindes*, or *Does*, and the *leggs* laid wide open, the *Bladder* of *Urine*, and *Vagina Uteri*, or *Privy* wherein the *Yard* of the *Male* is entertained, as also the *neck* of the *Womb*, and its situation, are presently discovered, together with the *ligaments* whereby it is fastened, as likewise the *Veines*, *Arteries*, and *Testicles*, as they call them: also the *Horns* of the *Womb*, even in these creatures, are more remarkable then the other parts of it.

But as for the *preparing*, and the *leading*, or *ejaculatory vessels*, there are no such things to be found here; nor (as farre as I know) in any other *Female* whatsoever: And *Anatomists* (who suppose that the *Female* doth emit a seed in *coition*) make too industrious an enquiry after them; for they are



are not at all in some; and in those in whom they are, they are never found in the same manner, or agreeing. Wherefore it comes neereſt to truth, which alſo (as I have obſerved) the greater part of *Women* acknowledg; namely, that they do not emit any ſeed in coition. And though the more ſalacious do diſcharge a certain moiſture in coition, yet I neither approve it to be fruitfull ſeed, nor neceſſarily conducing to conception; for very many do conceive without any ſuch effuſion at all: (and ſome alſo without any pleaſure) but of theſe more elſewhere.

The *Privity*, or *Vagina Uteri*, which is extended from the outward *Orifice* of the ſecret parts, to the inward *Orifice* of the *Womb*, is in a *Doe*, as in a *Woman*, ſeated between the *Bladder of Urine*, and the *Rectum inteſtinum*, or *Right Gut*, and is correſpondent to the *Yard* of the male in form, largeneſs, and longitude. And being diſſected, is diſcovered to be furrowed with oblong wrinkles and rugoſities, and alſo made glibb and ſlippery with a ſtiſſe moiſture. In its bottom, you may perceive a more narrow and cloſed *Orifice*, which is the beginning of the neck of the *Uterus*. through which, whatſoever is driven out from the cavity of the *Womb*, doth make its paſſage. And this is that *Orifice*, which *Phyiſtians* affirm to be ſo cloſely compreſſed, ſealed up, and concluded in a *Virgin*, and *Woman* with child, that it will not admit the point of the fineſt *Needle*, or *Probe*.

After this follows the *Neck*, or *Proceſs* of the *Womb*, which is a much longer and rounder paſſage in them, then in *Women*; and in its whole extension, from the bottom of the *Privity* to the *Womb* it ſelf, is much more fibrous, thick, and nervous, then theirs. And if you make incision into this

EX. LXV. Of the Uterus of Hindes & Does. 401

Neck, according to its longitude, you shall discover not only its exteriour ingreſs, which is conſpicuous in the bottom of the *Privity*, ſo exactly to connive, and cling together, that the air it ſelf though driven by ones breath, cannot arrive at the cavity of the *Womb*; but alſo five alike ſtreights more ranked in order, blocked up againſt the acceſs of any outward approacher, and ſticking firmly together by a glewy mucilage: juſt as the moſt compact and narrow oriſce of a *Womans Uterus* is locked up by a yellow glutinous ſubſtance. And ſuch narrow ſtreights as theſe, are diſcernable in the neck of the *Sheeps, Comes, and Goats womb*, all which are cloſe locked up, and forbid any admittance (which *Fabricius* alſo obſerved.) But theſe five Recesses are moſt diſtinguiſhable in a *Hinde*, and a *Doe*, appearing like ſo many ſeveral ports or oriſces of the *Uterus* tyed up, and ſealed faſt, which you may juſtly eſteem as ſo many Barracadoes oppoſed to the admiſſion of any thing whatſoever. So carefull doth *Nature* ſeem to have been, that in caſe any inſolent intruder ſhould have forced the firſt gate, yet his rudeneſs ſhould be foiled by the next, making like proviſion in the other Avenues, that ſo nothing might inſinuate it ſelf into the *womb*. And yet for all this a Probe being put in from the Cavity of the *Uterus* outwards, doth with eaſe paſs through all theſe ports, and finde a way out. For it was convenient that a paſſage ſhould be afforded to the diſcharge of *Flatulencies, Menſtruous Blood*, and other *Humours*; but all entrance debarred to the entertainment of outward things, though they be never ſo litle (as to the air it ſelf, or the *Seed*.)

This Uterine Oriſce is alike blocked up in all  
D d other

other *Animals*, as it is in *Women*; whose *womb* we have known so closed sometimes, that their *Courses*, *Purgations* after *delivery*, and other *humours*, have for want of free disburdening, excited most terrible *Hysterical affections*, insomuch that I have been fain to invent an instrument proper to this inconvenience, whereby the *orifice* of the *womb* being opened, the imprisoned superfluities might be released, and the recited casualties subdued; as also that *injections* might finde a reception in the cavity of the *womb*, by which I have sometimes cured the internal *Ulcers* of the *Matrix*, and also *Barrenness* it self.

The *Cavity* of the *Uterus* in *Hindes* and *Does*, is exceeding small, as the substance of the *Uterus* is very litle both in magnitude and thickness. For the *womb* in those creatures, is only as a *Porch*, or *Fore-Gate*, in the *Cavity* whereof lyeth an open way both on the right, and left hand, which leadeth to the *Horns* of the *Womb*.

For those parts are different in almost all other *Animals* which have *Blood*, from what they are in *Women*; in whom the chief part of the *womb*, is the *Body* thereof: but the *Neck*, and the *Hornes*, (as being onely *Appendixes*) are scarce discernable. For the *Neck* is short, & the *Horns* litle, like round & long processes, extended upwards from the bottom of the *womb*, like two *Trumpets*; the *Anatomists* commonly conceiving them to be the *Ejaculatory vessels*. But in the *Hinde* and *Doe*, as in all other *Viviparous Animals* which have blood (except only *Women*, *she-Apes*, and those *Female Animals* that are *whole-hoofed*) the chief part for *Generation* is not the *Womb*, but the *Horns* thereof. For in *Women*, and *whole-hoofed Beasts*, the place of *Conception* is the *Womb*, but in other *Animals*, the

Conception



Ex. LXV. Of the Uterus of Hindes & Does. 403

Conception is accomplished in the Horns of the Womb. And therefore Authors generally call those Horns by the name of *Uterus*, the *Womb*, saying, that the *Womb* in some *Animals* is bipartite, and in some not; understanding thereby the places of Conception, which are the Horns of the womb, wherein almost all *Viviparous Animals*, presertime *multipara*, especially those that bring forth several young ones at a birth, doe conceive: and unto which also all the *Uterine veins & arteries* are conducted, and the other *Genital parts* are subservient. Wherefore give us leave also, in the *History* of those *Animals*, to use promiscuously the name of *Uterus* or *Womb*, and of *Horns* of the womb, for the same thing.

In a Woman, as we have said, the two *Trumpets* neer the process of the Neck of the womb, which are perforated into the cavity thereof, are not commonly reputed proportionable to the Horns, but are conceited by some *Anatomists* to be *Vasa Spermatica*, *Spermatical Vessels*; by others, *Spiramenta Uteri*, the Pores of the *Uterus*; by a third sort, *Vasa semen deferentia*, aut *reservantia*, Leading Vessels, or Vessels reserving the Seed in them. As if they were a certain kinde of *Seminal vesicles*; when, in truth, they are answerable in proportion to the Horns of the womb of other *Animals*; as appears clearly, by their scituation, connexion, largeness, perforation, form, and function: for as other *Animals* do alwaies conceive in the Horns, so a Woman also is sometimes found to bear her *Fetus in Cornu sive Tubâ*, in the Horn or Trumpet of the womb, as the most learned *Riolanus* reports by the observation of other men, and I have seen with my own eyes.

Anthrop.  
l. 2. c. 34.

Those Horns do terminate in the Common Cavity,

which (like a *Porch* or *Threshhold*) is seated before them both; and is in *Deer* proportionable to the *Womans uterus*, as the trumpets of the *Womans womb*, are proportionable to the *Horns of the Deers womb*. But their denomination they assume from their figure; for as the *Horns of a Ram* or *Goat* are large at bottom, jutting out before, and again reflected backward; so also these *Horns of the womb* (in *Hindes* and *Does*) at their original are large and ample, and lessening by degrees as they look upwards, are at last retorted towards the *Spine of the Back*. And as those other *Horns* are inequal, knotty, and wrinkled in their forepart, but behinde appear smooth and even; so the *Horns of the Deers womb*, are below wrinckled, and gathered, by reason of certain cells or rings bunching out, in manner like the *Gut Colon*: but above (where they respect the *Spine*) they are smooth and even, and recurved, as if they were tyed back by a kinde of fillet-like *ligament*, and so by degrees grow slender as *Horns* do. If you take an *empty gut* (such a one as puddings are made in) keeping it contract, wrinckled, and streightned, by a tape or fillet which binds it all along on one side, you shall see it curled and distinguished into little cells or windings (after the fashion of the *Colick Gut*.) And such is the fabrick of the *Horns of the womb of a Hinde, or a Doe*. In other *Females* the case is different, for they either have larger cells, or none at all. And in these *Horns of Hindes* and *Does* also, though there be several cells or windings, yet are not all of equal magnitude, but the first is much larger then any of the rest, and in it chiefly the *Conception* is contained.

And as in a *Woman*, the *womb*, and its trumpets (or *Horns*) with the rest of its appurtenances, are tyed



Ex. LXV. of the Uterus of *Hindes* & *Does*. 405

tyed fast to the *Share-bones*, the *Back*, & the neighbour Parts, by the mediation of a broad and car-nous *Membrane*, (as by a pendulous band or tye) which Anatomists do stile *Vespertilionum alas*, the *Batts* wings; because the *Uterus* hanging in this manner, doth resemble a *Bat* with its *wings* spread abroad: so also in *Hindes*, and *Does*, the two *Horns* of the *womb*, together with the *Testicles*, and all the *Vessels* of the *Uterus*, are by a thick *membrane* fastened to the circumjacent Parts, (but especial-ly to the *Back*) which *membrane* performs the same office to the *Uterine* Parts, as the *Mesentery* doth to the *Guts*, and that which we call the *Meso-metrium* doth to the *Uterus* of the *Hen*. For as by the *Mesentery* the *Meseraick* Veins and Arteries are derived to the *Guts*; so are the *Uterine* Vessels disseminated through the fore-said *membrane*: in which also certain small *Bladders* and *Glandules* are on both sides discovered, which *Glandules* *Anatomists* commonly call the *Testicles*.

The substance of the *Horns* of the *Hindes* and *Does* *wombs* is *cuticular* or *skinny*, or else a *fleshy skin* or *coat* (like that of the *Guts*) besprinkled with certain *tender* Veins. This *coat* you may, as *Anatomists* use to do, divide into several *coats*, observing the several scituation of the *fibers*, which serve to several functions, namely to *Retention*, and *Expulsion*. For I have many times seen those *Horns* moving just like *Earth-worms*; in the same manner as any man may perceive the *Guts*, in an *Animal* newly killed, and the *abdomen* or covering of the lower belly laid open, stirring to and fro, in a kinde of *waving motion*, whereby (as if they were close begirt and bound in by some small narrow ring, or pressed and squeezed between ones fingers) they crowd down and depre-



the Chyle & Excrement towards the inferior Guts.

All the *Uterine Veins* do here (as in a woman) assume their original from the *Hollow vein*, neer the *Emulgents* : but the *Arteries* (which they also do partake as well as *Women*) do arise from the *Branches* of the *Great Artery*, which pass into the *Thighes* : and as in a woman great with child, the *Uterine Vessels* which contain blood, are more and greater then in the rest of her body ; so is it also with *Hindes* and *Does* which are with *Fawn*. But the *Arteries* (contrary to that Which we see in the rest of the body) are much more numerous for their proportion then the *Veines* ; and being blown into, they will distend, & fill their neighbour *veins*, but the *veins* being in the same manner blown into, will never do so much for them. And this also I see taken notice of by the learned *Riolanus*, and it is a prevalent argument for the *Circulation of the Blood*, which was my Invention ; for it doth clearly evince a passage from the *Arteries* into the *Veins*, but no retreat from the *Veins* into the *Arteries* again : & there are likewise more *Arteries* then *Veins*, because the *fetus* requires great store of sustenance to supply his growth, the remainder whereof fewer *Veins* are sufficient to return.

There are also *Testicles* discernable in these also, as they are in *Sheep*, *Goats*, and all *Animals* which cleave the *hoofe* ; but such *Testicles* as resemble the *Prostate*, or *seed Glandules*, and the *Kernels* of the *Mesentery* (whose office is to secure the divarications of the *Veins*, and retain a moisture in them whereby to keep the parts glib) rather then things designed to the concoction of *Prolifical seed*, and the *Reservation* or *treasuring* it up till it be fit for profusion in the time of *Coitition*. And this is my opinion of them, both for

sundry

Ex.LXV. of the Uterus of *Hindes* & *Does*. 407

sundry reasons elsewhere alledged: as chiefly, because that at the time of *coition* (when the *males* *Testicles* are swelled with *seed*, and full of seminal juice) the Horns of the *womb* indeed are in *Hindes* and *Does*, and all other *Viviparous Animals* (wherein they reside) much altered: but the *Testicles*, as they call them, (like things utterly unconcerned in the matter of Generation) do neither swell, nor differ any way from the constitution they were of (either before, or after *coition*) affording no testimony at all of their use either in respect of *Coition*, or *Generation*.

It is a wonderfull thing to see how great a quantity of *geniture* doth abound in the *Testicles*, and much distended Seminal Vessels of the very *masculine Moles*, and *Mice*, about the time of their *coition* (which we have also formerly observed in the *Dunghill-Cock*) and how vast an alteration is espyed in the Genitals of both Sexes; and yet these *Glandule*, or little *Kernels* (which men conceive to be the *Testicles* of the Females) do still reserve their wonted appearance, without any variation at all.

What we have hitherto observed, concerning the *Womb* and the Horns thereof in *Hindes* and *Does*, doth for the most part relate also to other *Viviparous Animals*, though they differ in a *Woman*; because she conceives in her womb, but all the rest in the Horns of the womb, except the *Mare*, and the *she-As*; and even they also, though they seem to bear their *Conception* in the womb, yet that place of *Conception* doth more resemble the nature and constitution of a *Horn*, then of a *Womb*: for that place is not *bipartite*, but something more oblong, and different from a *womb*, both in situation, connexion, fabrick, and substance,

stance, and ought rather to be compared to the superiour *Uterus*, or process of the *womb of the Hen*, (wherein the *Egge* groweth, and is encompassed with the *White*) then to the *womb of a Woman*.

## *Of the Coition of the Hinds and Does.*

### EXER: LXVI.

**T**He History of the *Womb of Hinds and Does*, is such as hath been shewed. Wherein we have briefly declared those things which did seem necessary to *Generation*, namely, the place of *Conception*, and those parts which are ordeined thereunto. It remaines that we now treat of the *Action* and *Function* of this place, namely of *Coition* and *Conception*.

*Hinds and Does* do admit their *Males* at one only set time of the year; that is about the midst of *September*, after the *Feast* of the *Holy Cross*, and they bring forth after the midst of *June*, neer the *Feast* of *Saint John Baptist*. So that they goe  
L.8. c.32. nine moneths, not eight, as *Pliny* would have it: for they calve or bring forth, with us at least, the ninth moneth after their first *Rutting*.

At *Rutting time* the *males* assemble themselves amongst the *females*, but at other times they feed apart: and the elder *Deere* (as the *Staggs*) do associate with their own *Sex*, and the *Hinds* and *Does* keep company and feed among the other *Hinds* and *Does*, together with the younger sort of *Eucks*, and *Fawns*. About a whole moneth their

*Rutting*



Ex. LXVI. Of the Coition of Hinds & Does. 409

*Rutting time* continues, which doth begin later, if the season be dry, but if it be moist and rainy, sooner. And therefore in *Spain* (as I am informed) they seldom rut before the *Calends* of *October*, because moist weather comes not on there til then. But in *England* their *Rutting time* seldom lasts beyond the middest of *October*.

At that time their lust enrages them so, that they will assault or *Doggs* or *Men*, when at other times they are shie and timorous, and suffer themselves to be chased and put to flight upon the alarme of the least barking *curre* that is.

Every *Male Deer* knowes all his *Females*, and will not indure any one of them to straggle, but will pursue and bring her back to his *Herd*: and being now grown very jealous of them, he frequently surveyes them, and rangeth them together. And if perhaps a stranger *Doe* intrude among them, he is not very passionate in her *expulsion*, but affords her a fair departure: but if another *Male Deere* address himself to this *Herd*, he bids him a speedy defiance, and charges him with his *Head*.

The *Hind* and *Doe* are numbered amongst the chaster rank of *Animals*; because they do not willingly admit *Coition* (for the *Stagge* and *Buck*, like the *Bull*, do celebrate their *Coition* with violence) and unless they be over-mastered, or tyred out with assaults, they shun the act. And this seemes to be the cause of the assembling themselves together in a *Herd* to their own proper mates, and chiefly to those that are the elder *Deere*, and are best headed: for if a forraigner attempt their chastity, they presently fly to their own *Herd* and comfort, for sanctuary, as the refuge of their affrighted modesty.

If

If a young Batchelour *Buck* finde a *Doe* straggling alone, he presently pursues, and having tired her by his chafing, he takes advantage of her inability for resistance, and so enjoys her by force.

All the *Male Deer* provide themselves a *Rutting* place at some distance from the *Herd*, by digging up trenches, or standing behind some convenient rise of ground, whither they constrain their *Females* to appear. She that is now about the act of *Rutting*, placeth her hinder feet in the furrow or trench provided for the purpose, and (if occasion be) inclining her body doth something depress her *Hanches*; by which means the *Stag* or *Buck* may at one inition (as *Bulls* do) pressing her forward, finish his affaires.

The *Elder*, and abler *Stags*, and *Bucks*, have a larger *Herd* of *Hinds* and *Does*, then the juniour and infirmer *Deer*: some assemble to themselves ten, some fifteen. Our *Keepers* say, that the *Females* are sated at the second coition, or third at the most, and the, so soon as she conceives, admits the *male* no more.

The *Male* when he hath fructified all his *Females*, his lust cooleth; and having impaired both his audacity, and his flesh, quits his *Herd*, straggles alone, and feeds greedily to repaire his broken strength, making no farther assault upon any *Female* all that year.

When the *Buck* growes first ripe for *Rutting*, the *Hair* about his *Throat* and *Neck* growes black; as also doth the extremity of his *prepuce*, which doth putrifie likewise, and stink extreanly.

The *Does* and *Hinds* are but very seldome compassed, and that too in the night time onely, and in obscure places, such as are purposely made choice

chance of by the *Males* for that performance. If the *Stags* or *Bucks* chance to contest (which is usual) then the conquered his *Females* are all made the *Victors* purchase.

*Of the Constitution or Alteration of  
the Uterus of the Hind and Doe  
in the moneth September.*

EXERCIT. LXVII.

**W**E now come to the Alteration of the *Genital parts* of the *Hind*, and *Doe*, after *Rutting time*, and also to the conception it self.

In *September*, when the *Hinds* and *Does* first *Rutting time* is now arrived, their *Uterus* (I mean the *Hornes* of the *Uterus*, or the place wherein they conceive) is become more fleshy, and thick, and likewise more soft and tender. In the cavity of each of the *Horns* of the *womb* (in that part which resembleth a wrinkled fillet; namely, where it reflects towards the *spine* of the *Back*) five *Caruncles*, or soft *Warts*, or *Nipples*, do jet out, being placed in order: whereof the first is the biggest of all, and the rest as they lie in order, are still one less then the other; just as these *Horns* themselves do lessen by degrees from the bottom upwards, to the very top. Some of these *Caruncles* do grow out as broad as the middle finger, (appearing like a kinde of a luxuriant, fungous, fleshy substance) being paler or whiter then some, and more ruddy then others.

About



About the six and twentieth, or eight and twentieth day of September (as likewise afterwards in October) the *Uterus* is grown thicker; and the *caruncles* being now more tumid, do resemble the *Nipples* of Womens Breasts: so that you would believe they were designed to yeeld *Milk*. Their top or uppermost part being cut away (for I divided the outward *superficies* from them, to discover their interior constitution) I beheld them compacted and formed out of an innumerable company of white points, as out of so many bristles set up stiff and erect, by a certain mucous viscosity or glewy substance, and pinching them hard from the roots upward, between my fore finger and my thumb, I squeezed out of each of those white points a small drop of blood. Whereupon by a more strict enquiry, I discovered them to be nothing else, but the *Capillary productions* of so many slender *Arteries*.

At *Rutting time* therefore, the *Uterine Vessels* (especially the *Arteries*) are discovered to be more in number, and more conspicuous then at other times: Though (as I have noted before) those that are called the *Testicles*, are neither more large, nor more full then they were before, nor any thing changed from their pristine constitution.

The *Cavity* of the *Uterus* (that is, of the *Hornes* of the *Uterus*) and interior superficies thereof (which you may call the wall of the little *Cells*) presents it selfe exceeding soft and glibbe to the touch, like to the interior concameration of the *Ventricles* of the *Braine*, or the flesh of the *Nut* of the *Yard*, which is within the *Prepuce*. But in that *Cavity*, I could never discover any *Sperme* ejected from the *Male Deere*, nor any other thing which relates to the *conception*, (though I have made

most

Ex. LXVIII. *What befalls the teeming, &c.* 413

most accurate dissection through all the entire moneths of *September* and *October*.) And yet the *Male Deere* did go to rut daily, and I dissected a great number of *Does*. And this is the result of many years experience.

I have seen indeed in some the *Caruncles* so nearly seated the one to the other, as if they had made one continued *protuberance* out of all the five united together. And when upon frequent experiment, I never met with any other thing within the *Cavity* of the *Uterus*, I began at first to consider, whether the *masculine seed* could by any means (namely either by way of *Injection*, or *Attraction*) insinuate it self into the seat of *Conception*? and at last my many repeated observations did ratifie this conclusion, namely, that no part or portion of the *seed* doth ever enter into those receptacles.

---

*What befalls them in the moneth  
of October.*

EXERCIT. LXVIII.

HAVING made several dissections in the month of *October*, as well before the expiration of the *Rutting time*, as after: I could never finde any *seed*, or *blood*, or the *track* of any other thing whatsoever, in the *cavity* of the *Uterus*. Onely the *Womb* or *Uterus* was grown larger and thicker, and the *Caruncles* more tumid and florid then before, and out of them upon a close constriction

or

or pinching them between the fingers, some small drops of blood did issue out, as a watery kinde of milk is expressed out of the nipples of the breasts of such as are with *Childe*, about the fourth moneth of their *pregnation*. In the *Uterus* of one, or two, which was exceedingly impaired and extenuated contrary to the course of *Nature*, I found indeed a kinde of a green, ichorous putrified substance, like to impostumated matter, filling the cavity thereof; whereas those very *Dies* were in all other points sound, and something fat, no less then their fellowes which I dissected at the same time.

About the End of *October*, and the Beginning of *November*, when the *Rutting time* is now concluded, and the *Females* and *Males* part company: the *Uterus* began to seem of a lesser bulk (in some sooner, and in others later) and the wall or sides of the inner cavity appeared to tumefie, as if it were puffed up; for in those places where of late the little Cells were, there did now round gobbets extuberate inwards, filling almost the whole capacity: so that the sides now seemed to touch one another, and glewed as it were together, leaving no space vacant between them. For as licorish Boyes (while they plunder the honey-combs, that they may greedily devour the honey) have their Lips so stung by the Bees, that they swell and grow tumerous, and so streighten the gap of their Mouths; in the same manner doth the interiour superficies of the *Does Uterus* become turgid, and a most soft and pulpous substance (like that of the *Braine*) doth fill the cavity, and involve the *Caruncles* in it. And as for the *Caruncles* themselves, they are no bigger then they were before, but only appear something paler, and as it were macerated or stewed in warm water, as the Nurses nipples look



look presently after the Childe hath had the breast. But I could not squeeze out any blood from them, as before.

This interiour superficies of the *Uterus* being thus swolne; it is at that time so tender and smooth, as nothing can be more. It resembles the softness of the *brain* it self, and when you touch it, did not your own eyes give evidence to that touch, you would not believe your fingers were upon it. The *cavity* of the *Womb* being laied open immediately after the killing of the *Deere*, I have often discovered a slow waving motion, (such a one as is seen in the bottom of a creeping *Snailles* belly) as if the *Womb* were *Animal in Animal*, one living creature in another; and had a peculiar independent motion of its own.

Such a kind of motion as this, I have (as I mentioned but now) often observed in the intestines of creatures dissected alive: & the same may be experimented both by the testimony of the sight and touch, in live *Dogs* and *Conies*, though you dissect them not. I have likewise observed the same kind of motion, in the *Testicles* and *Scrotum* of the *Males*; and I have known some *Women*, whom such palpitations have deluded with the hopes of being with Child. But whether in Hysterical affections (such as are the *Ascent*, *descent*, & *contortion* of the *Uterus*) the *Womb* of *Women* move and stir by such a kind of agitation; as whether the *Braine* also in its *conceptions* be in like manner moved to and fro, as the discovery is very difficult, so is it worthy the attempt.

A little while after the foresaid *Extuberance* of the interiour coat of the *Uterus* begins to shrink, and lessen: and in some, (but that is rare,) a certain *purulent matter* doth stick to the sides, (in manner

manner of sweat) such as is visible in wounds, and ulcers, when they are said to be *Concocted*, and cast forth a white, smooth, and equall matter. When I first discovered this kind of substance, I was in suspence, whether I should conceit it to be the seed of the *Male*, or some *concocted substance* arising from it. But because I did observe this matter but seldom, and in few onely, and also seeing twenty days were now past, since any commerce with the *male* had been celebrated, and likewise for as much as this *substance* was not thick, clammy, or froathy, (as seed is) but more friable and purulent, inclining to yellow, I concluded that it arrived thither casually rather, or else proceeded from over much sweat, the *Deere* being newly quite spent in the chace: and so in a *Rheume* falling down into the *Nose*, the thinner portion of the *Catarrh* being thickened into a mucous substance, puts on a yellow complexion.

This alteration in the Womb when I had often discovered to His Majesties sight (as the first assay towards *impregnation*) and having likewise plainly shewed that all this while no portion of *seed*, or *conception* either was to be found in the *Womb*; and when the King himself had communicated the same as a very wonderful thing to diverse of his followers, a great debate at length arose: The Keepers and the Huntsmen concluded, first, that this did imply, that their conception would be late that year, & thereupon accused the drough; but afterwards when they understood that the *rutting time* was past, and gone; and that I stood stiffly upon that, they peremptorily did affirm, that I was first mistaken my selfe, and so had drawn the King into my error; and that it could not possibly be, but that something at least of the

Con-

Conception must needs appear in the *Uterus*: untill at last, being confuted by their own eyes, they sate down in a gaze and gave it over for granted. But all the Kings Physitians persisted stiffly, that it could no waies be, that a conception should go forward unless the *males seed* did remain in the womb, and that there should be nothing at all residing in the *Uterus* after a fruitfull and effectual Coition; this they ranked amongst their *'As i'ra'la*.

Now that this experiment which is of so great concern might appear the more evident to posterity; His Majestie for tryal-sake (because they have all the same time and manner of conception) did at the beginning of *October* separate about a dozen *Does* from the society of the *Buck*, and lock them up in the Course neer *Hampton Court*. Now lest any one might affirm that doubtlesly these did continue the *seed* bestowed upon them in *Coition* (their time of *Rutting* being then not past) I dissected diverse of them, and discovered no seed at all residing in their *Uterus*: and yet those whom I dissected not, did conceive by the virtue of their former *Coition* (as by *Contagion*) and did *Fawn* at their appointed time.

In *Bitches*, *Conies*, and several other *Animals*, I have certainly discovered, that nothing after *Coition* is to be found in their *Uterus*, for many daies together. In so much that I am very well ascertained that in *Viviparous*, (as well as in *Oviparous* creatures) the *Fætus* doth neither proceed from the *Seed* of *Male* and *Female* emitted in *Coition*, nor yet from any commixture of that *seed*, (as the Physitians will have it) nor yet out of the *Menstruous blood*, as *Aristotle* conceits; and likewise that there is not any thing of the conception

E c      necess-



necessariily in being, presently after *Coiton*. And hence it follows, that it is not true, that in a *proliferical coition*, any matter is ready at hand in the *Vterus*, which matter or substance, the *Masculine seed* should concoct, coagulate and fashion, or reduce into an actual generation, or by drying its outward Superficies, *Form*, and After-birth to wrap it in. For nothing at all is to be found in the *Womb* for many days together, even to the twelfth of *November*.

It is also evident, that all *Females*, in the *Act of coition*, do not effund a seed into the *Vterus*; for neither in *Hinds*, or *Does*, or several other *Viviparous Animals*, is there any track or signe of either *Seed*, or *Menstruous blood*. But what it may be, which flowes from some salacious *Women* in *Coiton*, as well as from *Men*, which procures pleasure to them, and a kind of resolution of their *Spirits*; as also whether it do necessarily conduce to the *Conception*; likewise whether it do proceed from the *Testicles*, or whether it bee *seed*, and whether *proliferical* or not, we have elsewhere discovered.

And while I am in this discourse, let the ingenious bear with me, (if being mindful of my great wrongs) I let slip a sigh or two, grounded upon this my misfortune: namely, that while I did attend upon our late Sovereign in these late distractions, and more then *Civil Wars*; (and that not by the *Parliaments* bare permission, but command) some rapacious hand or other not onely spoiled me of all my Goods; but also (which I most lament) have bereft me of my Notes, which cost me many years industry. By which means, many observations (especially those concerning the *Generation of Insects*) are lost and imbezelled, to the prejudice (I may boldly say it) of the Commonwealth of Learning.

*What*

*What things happen in the Uterus of  
Deere in November.*

EXER. LXIX.

**A**Bout the twelfth or fourteenth day of *November* there is something, which is then first of all to be found in the *Cavity* of the *Womb* of the *Deere*, conducing to the future *fetus*, and this I truly avouch, and of many years Experience.

I remember indeed, that in the year of our Lord 1633, these signs or rudiments of conception did appear sooner, because it was a cloudy, and wet season. In *Hinds* also, which go to *Rut* six or seven days before the *Does*, I have still discovered some track of the future conception, about the eighth or ninth day of *November*. But what that is, and how it doth begin, I shall now declare.

A litle before any thing at all is to be seen, the substance of the *Vterus*, or *Hornes* appear lesser, then when the *females* first went to *Rat*; and the white *Caruncles* are more flaggy (as I informed you before;) and the *protuberance* of the inward coat doth a litle abate, growing more wrinkled, and moist. For about the time aforesaid, some certain mucous filaments (like the *Spiders threads*) are led from the last or upper angle of the *Hornes* of the *Vterus*, through the midst of both the *Horns*, and also through the cavity of the *Womb*, which being joined together, do resemble a membranous or filmy coat, or empty *waller*. And as that complication or web of vessels called *Plexus Choroides*, is led through the *Ventricles* of the *Brain*, so this



little oblong sack, or wallet is spun over all the space of both the *Horns*, and the intermediate cavity of the womb. In which dissemination, insinuating it self into the rugosities of the flagging membrane, it doth insert slender fibres between the fore-mentioned round extuberances or nipples; after the same manner as the membrane called *Pia Mater* doth work it self into the convolutions of the braine.

A day or two being now over, this wallet is filled with a watry, white, stiff, albugineous substance, and being stuffed with that moisture, doth resemble a long pudding, sticking or cleaving a little to the containing sides of the *Vterus* by its exterior glutinosity; and yet so, that it may be easily separated from them: for being taken in the narrow part of the *Vterus* (where it is tied to it as it passeth along) it may be brought away entire from both the *Hornes*, if it be warily handled.

This Conception now grown, and taken out, is of the figure of a wallet, or double pudding: being besmeared on the outside with a kind of purulent filth; but within it is glibbe, containing in it a stiff moisture, much like to the more liquid White of an Egge.

Now this is the first Conception of Hinds and Does. And seeing the nature and condition of an Egge, together with the definition is applicable thereto, for Aristotle defines an Egge, to be that thing out of part whereof an Animal is begotten, and the remainder is the food of that Animal which is begotten: and likewise, seeing it is the ground-work or rudiment of the future fetus, it is therefore also called *Ovum Animalium*, the Animals Egge, According to that of Aristotle. Those creatures which beget an Animal within themselves, have upon

Hist. an. l.

1. c. 5. &

de gen. an.

l. 2. c. 1. de

gen. an. l. 3.

c. 9.

Ex. L.  
the fir  
net of  
Membr  
Egge  
ous are  
as we  
seeds, en  
and pro  
therelo  
faith, th  
Membr  
tes reco  
such as  
second  
ous egge  
times al  
and at t  
gitude  
Membr  
yet att  
fastened  
onely a  
stuck wi  
the first  
or Cake  
ling simo  
ral prop  
third M  
magnitu  
length o  
Moneth,  
And the  
Abortion  
And i  
for a tw  
their Rat  
the



Ex. LXIX. Uterus in November.

421

the first conception something formed in them in manner of an egge. For a moist substance is contained in a Membrane, just as if you should pill off the shell from the Egge: whereupon the depravations of these conceptions are called fluxes. This Conception therefore, as we said before of an Egge, is a true sperme, or seed, embracing in it self the virtue of both Sexes, and proportionable to the seed of Plants. Aristotle *Hist. an. l. 7. c. 7.* therefore describing the first Conceptions of Women, saith, they are, as it were, an Egg covered over with a Membrane, but the shell taken off: such as Hippocrates records to have dropt from the Minstrel, and such as I have often seen fallen from Women in the second Moneth, which was of the bigness of a Pigeons egge, without any fetus at all in it: and sometimes about the bulk of a Pheasants, or Hens egg: and at this time the floating Embryo is of the longitude of the naile of the Little-finger. But the Membrane involving the Conception, hath not yet attained any After-burden to which it may be fastened, nor is it fastened to the womb it self; but onely at its obruser and upper end, as if it were stuck with moss or down, it presents to our view the first designs and rudiments of the After-burden, or Cake of the Womb: but the inner superficies being smooth and glib, is divaricated with the several propagations of the Umbilical Vessels. At the third Moneth, this Egge exceeds a Goose-Egge in magnitude, and infolds within it an Embryo of the length of two transverse fingers. At the fourth Moneth, it is larger then the Egge of an Ostrich. And thus much I have diligently observed in Abortions, having made several dissections of them.

And in this manner do Hinds and Does, though for a whole moneth together (and more) after their Rutting time, no sensible thing at all be contained

rained in their uterus, produce by a kinde of *Con-  
tagion*, these conceptions and rudiments in the shape  
of eggs, (as *Plants* bring forth their seed, and *Trees*  
their fruit) which about the eighteenth or one and  
twentieth day of *November* (at the farthest) are  
complete, and that sometimes in the *Right Horn*,  
and sometimes in the *Left*; and at other times in  
both: having in them a certain dissolved sub-  
stance, transparent, & crystalline (which we call  
the *Colliquamentum*, or *Eye* in the *Hen-egg*) which is  
contained in a proper thin orbicular coat of their  
own, being much purer then that humour where-  
in the *Conception* swims afterwards; in the midst  
whereof the *sanguineous fibers*, & the *Punctum saliens*  
(which is the first foundation of the future *fetus*)  
without the presence of any thing else, are clear-  
ly discerned; and this is the first *Genital particle*.  
Which being constituted, not onely the *Vegetative*  
*soul*, but the *Motive* also is said to be in it, from  
which all the other parts of the *fetus* are each in  
their order generated, formed, disposed, and en-  
dowed with life: after the same manner as we  
have declared the *Chicken* to be constituted out of  
the *Colliquamentum* of the *Egg*.

Both these humors are in the *Conceptions* of all  
*Viviparous Animals*; which many men conceive to  
be the *Excrements* of the *Fetus*, deeming the one  
to be its *urine*, the other its *sweat*; when not-  
withstanding they have no offensive taste at all,  
and are alwayes most manifest in the *Conception*,  
even before any particle of the *fetus* is discern-  
ed.

The *Outward coat* which embraceth both the  
humours, is called *Chorion*; the *Inward*, *Amnion*.  
And more then these two you can never finde; the  
former, involving the whole *Conception*, and exten-  
ded



Ex.LXIX. Uterus in November.

423

ded over both the *Horns* of the *uterus*; the later, swimming in the first *water*, and contained onely in one of the *Horns*, except there be a *Twin-fetus*; in which case, there is one in each of the *Horns*: as in the *Gemellifical* Egge there are two *Colliquamentums*. So that where there is a double *fetus*, they are both contained in one and the same *conception*, together with their two-fold *crystalline waters*: (as in one and the same *Egg*.) If you make an incision into any part of the *Exteriour membrane*, the more impure *water* will presently issue out from both the *Horns*; but the *crystalline water*, which is comprehended in the interiour *membrane* called *Amnion*, doth not flow forth with the former, unless you have peirced it also.

The *Vein*, which is first seen within the *Amnion*, in the *crystalline humour*, takes its original from the *Punctum saliens*; exercising the office, and partaking of the nature of the *Umbilical Vessels*; and being by degrees enlarged, it is disseminated into other *ramifications*, which are scattered into the *Colliquamentum*: whereby it is most evident, that the *nutriment* is at first attracted from the *Colliquamentum* only, wherein the *Fetus* swims.

Having dissected the *uterus*, I have exposed this *Punctum saliens*, while it yet continued its palpiation, to the view of our late dread *Sovereigne*; which was then so small, that without the advantage of the *Sun-beams* obliquely illustrating it, he could not have perceived its shivering motion.

The entire *Colliquamentum* being cast into a silver or tinn-Bason, which is full of clear warm *water*, doth very neatly lay open the *Punctum saliens* to the eye. To which, in the following dayes, a certain gelly, like a litle worm, in the form of a *Magot*, is adjoined, (as being the first platform of



the future *body*) divided into two parts; of one part whereof the *Trunk* is constituted, & the *Head* of the other: in the very same manner, as hath been formerly delivered in the History of the *Hen-egg*. The *Spine* of the *Back* is a litle inflected in manner of a *Keel*; the *Head* is imperfectly composed of three small *vesicles*, or 'little balls, and swimming in the *Crystalline water*, doth dayly enlarge, and grow into shape: With this difference only, that the *Eyes* are much larger, and more visible in *Oviparous*, then in *Viviparous productions*.

After the six and twentieth day of *November*, the *fetus* is discerned, having his whole *body* almost compleat; being found without distinction, sometimes seated in the *Right*, and sometimes in the *Left horn* of the *Uterus*: but where there is a *Twin-fetus*, there is one of them placed in each of the *Horns*.

And at this time the *Male* is distinguishable from the *Female* by his *Genital parts*; which are conspicuous in a humane *Embryo*, so soon as ever the *rough Artery* doth appear.

You shall finde the *Male* and *Female* sometimes in the *Right*, and sometimes in the *Left horn*, meerly as it falleth out. But yet the *Male* is more frequently discovered in the *Left*, and the *Female* in the *Right horn*, and this frequently in *Doves*, which have *Twins* within them, and I once also observed it in an *Ewe*. Whence I am confirmed, that the proper constitution, or peculiar virtue of either *side*, doth signifie nothing to the *discrimination* of the *Sex*. Nor is the *uterus* the *Fabricatour* or former of the *Fetus*, no, nor the mother her self, any more then the *Hen* is the framer of the *Chicken* in the *Egge* whereon she sitteth. But as the *Chicken* is made in the *Egge* by an *internal formative Agent*,  
so

LXIX. Uterus in November.

425

So likewise is the *fetus* constituted out of this *Egge* of the *Doe*.

A man would admire to see the *Fetus* formed and compleated in the *Amnion*, in so small a time after the first rise and beginning of the *Blood* and *Punctum saliens*. For about the nineteenth or twentieth day of *November*, that *Point* makes his first appearance: about the one and twentieth or two and twentieth day, the little unshapen *Worme* or *Maggot* discovers it self: but within six or seven daies after that, the *Fetus* is so compleat, that you may distinguish the *Male* from the *Female*, (by the *Genital parts*) and perceive the feet formed, and the little hooves cleft, being then like *Gelly*, something inclining to yellow.

So soon as ever the *fetus* begins to be formed and grow, the substance of the *Uterus* is much extenuated: contrary to the custom of it in *Women*, whose *Womb* according to the increase of the *Fetus* becomes thicker, and more fleshy. For in *Hinds*, and *Does*, how much the more the *fetus* augmenteth, so much the *Hornes* of the *Uterus* approach neerer to the shape of the *Guts*: and chiefly that *Horne*, wherein the *Fetus* doth reside, doth resemble a little wallet, though in its extent and capacity it exceed the other.

This *Egge* or *Conception*, doth as yet on no side adhere, or grow fast to the *Matrix* (though the *fetus* is now compleat) but may bee very easily drawn away whole; as I have tried it in an *Ewe*, which bore a *fetus* in her *Womb*, almost the length of my *Thumb*. Wherefore it is most apparent, that the *fetus* is yet onely nourished by the *White*, which is shut up with it in the *Conception*, as it hath been observed in the *Hen-egge* before; for the *Orifices* of the *Umbilical Vessels* are quite obliterated

terated between the *White* of the *Conception*, and the adjacent *humours* with their *membranes*; not being any where as yet fastned to the *Uterus* itself, though those *Veins* or *Vessels* onely are the convey to administer nourishment to the *fetus*. And as in an *EGGE* the *propagations* of the *Veins* are first disseminated into the *Colliquamentum*; (as the roots of plants are into the ground) and are afterwards communicated to the *exteriour Membrane* (called the *Chorion*) and do dispatch their *branches* up and down with innumerable *divarications* through the *albugineous humour* contained in the utmost membrane, that so they may forage, and provide *Aliment*: so likewise in *humane abortions*, I have plainly discovered the *vein* in the *Chorion*; and *Aristotle* himself affirmed, that that coat was full of *veins*.

Hist. an. l.  
7. c. 7.

If there be a single *fetus*, the *distribution* of its *Umbilical vessels* is extended to both the *Hornes* of the *Womb* (having little *branches* disseminated through the *cavity* thereof) that so it may attract *aliment* on both sides. But if there be two (namely one in each *Horne*) they both shoot forth their *Umbilical propagations* into that part onely of the *Conception* which borders upon their proper *Horn*: so that the *fetus* seated in the right *Horne* deriveth his *sustenance* from the *right side* of the *conception*, and he in the left from the *left* onely: The *Gemellifical conception* being in all other matters also like the *Gemellifical EGGE*.

Now, about the end of *November*, all the parts are clear and distinct, and the *fetus* now appears of the magnitude of a large *Beane*, or a *Nutmeg*: the hinder part of his *Head* being a little prominent, as it is in a *Chicken*, but his *Eyes* are lesse. His *Mouth* lies gaping wide even from *Ear* to *Ear*:  
for



Ex.LXIX. Uterus in November.

427

for the Cheeks and Lips are last of all perfected, as being *cutaneous parts*. So that in all Productions (even in *humane* also) the slit of the Mouth is dilated as far as the Ears on both sides, having neither Lips nor Cheeks to abate it. And for this cause, as I conceive, many are born with *cleft lips*, (we call them *Hare-lips*, that is, having such lips as *Hares*, and *Camels* have) because in the formation of the *humane fetus*, the *upper lips* do very slowly close.

I have often times cast the *fetus*, when it was now grown to the quantity of a *fair Bean*, being transparent under his coat *Annios*, and swimming in his most pure *aliment*, into a *silver bason* full of the clearest *water*, whereby I discovered chiefly these most remarkable following things. His *brain* being of a litle thicker consistence then the *White* of an *Egg*, (like *milk* a litle coagulated) of a rude shape, lieth encompassed on every side in a *membrane*, having as yet no *scull* at all. The *After-brain* stands up something prominent, as in a *Chicken*. The *Cone* or whole *frame* of the *Heart* looks *white*, and so also all the other *Bowels*. (even the *Liver* itself) are *white*, and as it were *spermatical*. The *Trunk* of the *Umbilical Vessels* doth arise from the *heart*, and passing the gibbous part of the *Liver*, doth insert it self into the *Trunk* of the *Vena Porta*, or *Gate Vein*; and running thence a litle farther, and distinguishing it self into several *propagations*, it is diffused through the *colliquamentum*, and the coat called *Chorion*, by an infinite number of *branches*. The *Sides* on both hands arise from the *spine*, so that the *Thorax* or *chest* looks like a *boat*, or litle *pinnacle*, before the *Heart* and *Lungs* are retired into its *circuite*: just in like manner as it is in the *chicken*. For the *Guts*, *Heart*, and the rest

of

of the Bowels are very conspicuous, and seem to be little *appendixes* of the body; untill at last the *chest* and *coverture* of the lower Belly are drawn over them (as the *Roofe* is erected upon the open *roomes*) and so veil and conceal them. At that time the sides as well of the Breast, as the Loines, seem to be *white, mucilaginous*, and of a *similar constitution*, excepting onely that through the inside of the Breast, some certain slender *capillary lines* do run along, and so occasion a distinction between the future *Ribs*, and the *carnous* or fleshy parts of the sides.

I have also sometimes seen the *Twinne-fetus* in the *Conceptions* of *Ewes*, which have been about the same time whereof we now speak (and sometimes one alone) which were of the *longitude* of a *transverse finger*: their form was like that of the smallest *Lizard*, and their *magnitude* like that of a *Wasp*, or *Worm* called *Eruca*: the *Spine* of the back was bent round, so that the head did almost reach to the *taile*. Both of them did swim in a peculiar clear *humour* of their own, inclosed within the *Amnion*: and both were of the same *magnitude*, (as if they had been begotten at one and the same act of *coition* and *conception*) For though the one lay in the *right*, and the other in the *left Horn*, yet both were included in the same *pallet*, and in the same *exteriour water*: (and so consequently in the same *egge*, or *conception*.) Their *mouthes* were wide, but their *eyes* were small, and scarce discernable *points*; contrary to those of *Birds*. Their *Bowels* or *Intrals* also were not as yet inclosed within the *cavity* of the body, but were hanging out. Their *Exteriour Membrane* called *Chorion*, did not adhere to the *Uterus*, so that I could not take away the *conception* whole & entire.

tire. There were also in the same coat an infinite number of *Umbilical propagations* which had no connexion at all to the *Uterus* : as we have noted in *Deer* also, and after the same manner, as we have described them in the outward membrane of the *Hen-egge*. There were onely present two humours, and as many coats containing them : whereof the exterior called *Chorion*, was extended over both the *Horns*, and being full of a more turbid humour, did fashion or shape the egge, or conception. But the coat called *Amnios*, was almost invisible (like that coat of the *Eye* which is called *Arachnoides*, or the *Cobweb*, being the membrane of the *Crystalline humour*) containing in it a clear bright *Water* like *Crystal*, wherein this *fetus* of the *Ewe* did swim.

The humour contained within the *Chorion*, was in proportion a hundred times more (I might say a thousand) then the other, though the *Crystalline humour* too which is reserved in the *Amnios*, was in a larger quantity, then to be suspected for the *Sweat* of so small a *fetus* swimming amidst it. Nor was it of any distastful savour, or sent; but exceeding clear : and (as we have noted in *Hinds* and *Does*) resembling thinne watry milk, being tainted with no kinde of excrementitious pravity. Now in case this humour were an Excrement, it would also grow and encrease as the *fetus* it self doth : But I finde the matter clean contrary in the *fetus* of the *Ewe* also ; for a litle before it is eaned, there is scarce any portion of this humour left. Wherefore I conceive it rather to be the *Aliment*, then the Excrement of the *Fetus*.

The Interior coat of the *Ewes womb* was imbosed with an infinite number of *caruncles*, (as the *Skie* is with *starres*) which were of the likeness of *Crabs*



*Crabbs eyes*, as I call them, but something less; and resembling loose or hanging warts; were glandulous, and white, sticking within the coats of the womb, being something hollow or excavated on that side wherewith they incline towards the Conception: (contrary to their course in *Hinds* and *Does*, in which they do extubérate towards the *Fœtus* it self) and besides all this, they did strut with blood; and their interior *superficies*, as it did direct it self towards the conception, was full of black, sanguineous points. The *Umbilical Vessels* of the *Fœtus* were not as yet inserted into these *caruncles*, nor was the conception hitherto fastened to the *Uterus*.

As for that coat, which they talk much of, and call *Allantoides*, I can finde no such matter in the conceptions of *Ewes*; but afterwards (when the *fœtus* is now grown bigger) when the *Egge* or Conception doth now cleave to the *Uterus*, and the veins are inserted into the *caruncles*, then is the *Chorion* extended farther, and in its two ends (or *Appendixes* as it were) a certain humour died yellow (you would conceive it to be an excrementitious humour) is secluded, and reserved apart from the rest.

As for a *Humane Conception*, that hardly differs any thing from an *Egg*, for the first months. For before the *After-birth* or *Uterine cake* hath been framed, I have seen a white humour (like to the thinner *White* of the *Egge*, and equal in magnitude to a *Pigeons egge*, nay sometimes to a *Pheasants*) encompassed in a slender membrane; wherein the *Embryo*, who was as long as the nail of the little finger, did appear like a small frogge: having a broad body, a wide mouth, and his arms and leggs newly shot forth, like the young buds of flowers.

he

# Ex.LXIX. Uterus in November.

he had a prominent *Occiput*, or *After-braine*, which may be rather called a *little bladder* annexed like an *appendix* to the rest of the *head*, as hath been mentioned in the first rudiment of the *Occiput* of *chickens*.

An other *humane Conception* I saw (which was about fifty dayes standing) wherein was an *egge*, as large as an *Hen-egg*, or *Turkey-egg*. The *fetus* was of the longitude of a *large Bean*, with a very great *head*, which was over-looked by the *Occiput*, as by a *crest*; the *Brain* it self was in substance like *Coagulated milk*; and instead of a *solid skull*, there was a kind of *Leather-membrane*, which was in some parts like a *gristle*, distributed from the *fore-head*, to the *Roots* of the *Nose*. The *Face* appeared like a *Dogs snout*. Without both *Ears*, and *Nose*. Yet was the *rough Artery*, which descends into the *Lungs*, and the first rudiment of the *Yard*, visible. The two *deaf-ears* of the *Heart*, appeared like two *black eyes*.

In a *Woman with childe*, who dyed of a *Feaver*, I found an *Hermaphrodite Embryo* of almost the same bigness. Its *Privy* was like that of a *Cony*, the *labra* resembling the *prepuce*; and the *Nymphæ*, the *Glans* or *Nut*. Above this *privy* I saw the first rudiments of a *Yard*, to which there hung down on both Sides, instead of *Testicles*, the *laxe* or *flaggy skin* of the *Scrotum*, or *Cod*. Its *Uterus* or *womb* was very litle, resembling the *Uterus* of an aborted *Lamb*, or *Mole*, having both the *Horns*. And as the *Glandules* or *Kernels*, called *Prostate*, were scituate neer the *Yard*, so also were the *Testicles*, which were of a discernable magnitude, placed next to those *Horns*. So that, according to outward appearance, it did most expresse a *Male childe*, but upon inward discovery of the *Parts*, a *Female*.

The

The *womb* of the woman that bare it, was very vast, having the *bladder of Urine* adjoined to it (as its *Appendix* :) but contrariwise in the *Fetus*, the *Bladder of Urine* was large, and the *Uterus* looked onely like its *Appendix*.

All these fore-mentioned *humane Conceptions*, like the *Ewes*, had a rough or wrinckled *superficies* outwardly, and were dawbed over with a kinde of *Gelly*, or *glutinous substance*; and at that time, there was neither any appearance of the *After-burden*, nor yet any union of the *Conception* to the *matrix*, nor any insertion of the *Umbilical Vessels* into the *matrix*, or *womb*, though they were disseminated into the *superficies* of the *Conception*.

Though diverse *fetus* are sometimes found in the same *Conception* of *Hindes*, and *Does*, (as divers *Chickens* in the same *white* of a *gemellifical Egg*) as it also happeneth in *Ewes*, *She-Goats*, and other cloven footed creatures: yet in *Bitches*, *Conies*, *Sowes*, and other *Viviparous* and *Multiparous Animals*, the matter is clean otherwise; for every *fetus* in them doth challenge two several *humors*, and two distinct coats.

In *Bitches* there are several *Knots* through the whole cavity of the *Horns* of their *uterus*, in which so many several *humors* are contained, and in every one of them a several *Fetus*. In the *Hare*, and *Cony* which are *Does*, you may perceive many round *gobbets* or *balls* (such as the *eggs* of *Serpents* are) like *bracelets* made of several *Amber beads*.

The *Hares Conception* is exceeding like an *Acorn*, and the *After-burden* covereth it in manner of a *Cup*; and the *Humours* contained in the *membranes* hang down like little *Acorns*.



Of the manner how the Conception of  
Hindes, and Does, is found to  
be in the month of De-  
cember.

EXER. LXX.

IN the beginning of December, the *Fætus* is now  
more grown and perfect, being of a fingers  
length. The *Heart*, and other *Bowels*, together  
with the *Guts* (all which were formerly exposed  
to publick view) are retreated into the hollow of  
the *body*; so that you can neither discern them,  
nor the motion of the *Heart*, without dissection.

The *Conception* or *Egge*, by the mediation of the  
five *Caruncles* in each *Horn*, (formerly spoken of)  
is in five several places adjoined and fastned to the  
*Uterus*, yet not so firmly neither, but that a small  
force will disjoin them again. Which being done,  
you shal discern the different print of the *Caruncles*  
in the outward superficies of the *Chorion*, by which  
*Caruncles* it was united to the *Uterus*, the impression  
which they leave behinde them being rugged and  
viscous, as if by that glew or paste, the said adhe-  
sion or conjunction had been effected. And thus  
have we revealed the *Nature* and *use* of these *Ca-  
runcles*; for they which before (like *Warts* or  
*Mushrooms*) were bred at the *sides* of the *Uterus*, do  
now, being knit to the *conception*, supply the place  
and office of an *After-burden*, or *Uterine Cake* (as it  
is in *Women*) namely, they are instead of so many  
nipples from which the *fætus* by the assistance of his

Ff Umbilical

*Umbilical Vessels* doth derive to himself such *Aliment* as his Mother affords him : as shall appear hereafter.

The *Magnitude* and *capacity* of the *Vterus* (under which name we understand the *Hornes* of the *Vterus* ; namely the places of *conception*) do enlarge according to the growth of the *fetus*, but yet so, that, that *Horn* wherein the *fetus* setteth his abode, is larger then the other.

Their *conception* or *egge* is one onely ; whether they produce a single, or diverse *Fetus* : and that single *conception* is dilated over both the *Horns* ; so that it looks like a brace of *puddings*, or rather like one onely, and that tied in the middle, as hath been formerly said : for passing along slender, and round, from the farthest part of the *Horne* on one side, it doth by degrees enlarge, and so goeth on to that common place, which in a Woman we call the *Womb* and *Matrix* or Mother ; (because a Woman in that part is made a Mother, by conceiving and fostering a *fetus* in it) where it is streightned as if it passed through an *Isthmus* ; and being again dilated, as it arriveth at the other *Horn*, it proceedeth still on to the farthest extremity thereof likewise ; where growing less, and pointed (as it did at the beginning) it erects its *non Ultra*, and proceeds no farther. Therefore these kind of *conceptions*, if they be drawn away entire, do resemble a *wallet* whose both ends are full of *Water* : and thence also that *coat chorion*, is likewise called *Allantoides* ; because the *conceptions* of such Animals resemble a *Gut* blown up, or *stuffed pudding*, which is tied fast in the midst.

If you dissect an *Embryo* at this time, you shall discern all the interiour parts distinct, and compleat : but chiefly the *Stomack*, the *Heart*, and *Kidnies*,

Ex.LXX. *Conception in December.*

435

*Kidnies*, and the *Lungs*; which are also divided into their *Lobes*, and look as they had *blood* in them, having gained their just form. But the complexion of these *Lungs* is more ruddy, then of those which have at any time breathed; because the *Lungs* stretched and dilated by the *Air*, put on a whiter colour. And by this observation of the different complexion, you may discover whether a *Mother* brought her *Childe alive* or *dead* into the *world*; for instantly after *inspiration* the *Lungs* change colour: which colour remains, though the *fetus* dye immediatly after.

In a *Female fetus*, the *Testicles* (improperly so called) are seated neer the *Kidnies*, in the hanging or loose *ligament* of the *uterus*, or *womb*, at the ends or extremities of the *Horns* on both sides; and are for their proportion larger in a *fetus*, then in a grown body, and look white, like the *caruncles*.

In the *Stomack* of the *Fetus*, there is found a watery substance, (not unlike that wherein he (swims) but something more troubled, and less transparent: like to that *milk* which is drained out of *Womens breasts*, that are about four or five moneths gone, or like *white Posset* as we call it.

In the *upper Guts* there is store of *chyle* made of the fore-said substance now concocted. But in the *Colon* or *colick Gut* there do begin to appear yellow excrements, and shaped.

But as for the *Urachus* (or Perforation of the *Navel* of the *fetus*, by which it is imagined to discharge the *urine* into the coat called *Allantoides*) I finde no such matter; nor any difference at all between the coat *Allantoides* (which is supposed to contain the *urine*) and the *Chorion*; nor do I discover any *urine* in the *After-birth*, but onely in the

FF 2

Bladder,



Bladder, and in that, good store: the *Bladder* it self, being something *Oblong*, is scituate between the *Umbilical Arteries*, which arise from the branches of the descending *Trunk* of the *Great Arterie*.

The *Liver* is rude, and almost inform or unshapen, as if it were something besides *Natures* intention, it looks onely like a *ruddy affusion* of *Blood*. The *Brain* being now somewhat reduced into shape, is comprehended in a *thick membrane*. The *Eyes* lie concealed under the *lids*; and those *lids* are so starched together, and shut so fast (as it is with *puppies* newly *whelped*) that I had much ado to disjoin them, and open the *eyes*. The *Breast-bone* and *Ribs* do now harden by degrees: and the complexion of the *Muscles* shifts from *white*, to be *blood* coloured.

Having made very many several *dissolutions* for the whole course of this Moneth, I am become more assured, that the *caruncles* before mentioned, do exercise the office of an *Aster-birth* or *Uterine cake*; which I now discerned to be *red* and *swelled*, and about the bigness of a *Wall-nut*. The *Conception*, which, as we said, did before stick only to the *caruncles* by the help of the *glutinous substance*, doth now dispatch the *litle branches* of the *Umbilical Vessels* into the very *body* of the *caruncles* (as *Plants* work in their *Roots* into the *earth*) by which it is fastened, and grows to the *Womb*.

About the end of *December* I have seen the *fetus*, being then about a *span* long, lustily bestirring himself, and kicking; opening his *mouth* and *jawes*, and also shutting them again. His *heart* was now placed in its *purse*, or *pericardium*, and the *Breast* being dissected, it was very discernable, making apparent and forcible *Palpitations*; and yet

Ex. LXX. *Conception in December.*

437

yet the *Ventricles* of the *Heart* were *Vniforme*, and of *equal magnitude*, and did consist of *equal height*, or of a *double cone*: the thickness also of their *sides* was *equal*. Where also I clearly discerned the *deaf ears* of the *Heart*, which at this time were full of blood, like two pretty large *bladders*, to continue and persist in their motion for a little space, even when the *Heart* it self had resigned it up.

All the *Bowels*, which were indeed perfect before, are now larger and more conspicuous. The *Scull* is partly *cartilagineous*, and partly *bony*. The *Hoofs* are yellowish, flexile, and soft (just as the *Hoofs* of grown *Deere* are, being mollified in seething water) the *Caruncles*, now very great, (as large *Mushroomes*) are spread over the whole cavity of the *Uterus*, and do evidently supply the use of an *After-birth*: for several propagations and those large ones too, are from the *Umbilical Vessels* disseminated into them, that so they may derive aliment to the *fetus*: in like manner as in those that are already in the world, the *chyle* is transported by the *Meseraick branches* into the *Gate vein* of the *Liver*.

In whatsoever *Conception* of this kind, there is but one onely *fetus*, there the *Umbilical vessels* are conveyed to all the *caruncles*: (as well of the opposite, as the same side) but in that conception where there is a double *fetus*, there the *ramifications* of the *Umbilical vessels* relating to each *fetus*, are not propagated beyond the *caruncles* of the same side wherein it resideth.

The *lesser Umbilical veins* as they respect the *fetus*, do where they unite and join together determine and end in other greater *Veins*; and those again passing farther on, and uniting, do conclude

in Veins yet greater then themselves, till at the last they constitute *two trunks*, which being conjoined, do convey *Blood* into the *Hollow*, and *Gate Vein*. But the *Vmbilical Arteries* (arising from the branches of the *descending Trunk* of the *great Artery*) are *two*, and those very *small* ones, and such as were it not for their *pulse*, could scarce be discerned, which being carried along, to the capacity or superficies of the *conception* where the *caruncles* or *After-birth* meet the *propagations* of the *Veins*) do first diminish or lessen into *capillary threads*, and at last become quite invisible, and are clean expunged.

As in the *Vterus* the *Extremities* of the *Vmbilical vessels* are terminated into the *caruncles*, so likewise out of the *Vterus*, the *Vterine vessels* (which are many, and large) carrying *blood* from the *Mother* to the *Womb* (by the conduct of the *suspensory ligaments*) do terminate outwardly in those very *caruncles*. We are also to take notice, that the *Interiour vessels*, are all of them *Veins*, for the most part : but the *Exteriour* are for the most the *propagations of Arteries*. In the *Womans After-burden*, if you mind it well, presently after she is delivered, are many more *Arteries* then *Veins*, and also larger too, which are disseminated with almost innumerable *propagations* up and down, even to its utmost *superficies*. As also in the *fungous Parenchyma*, or *Affusion* of the *Spleen*, which is not unlike it, the number of the *Arteries* exceedeth that of the *Veins*.

The *exteriour Vterine vessels* do, as I say, tend towards the *Matrix*, and towards the *Testicles*, which are seated in the *suspensory ligament*; as some men imagine.

In the *Gibbons* or *convex part* of the *caruncles*, which



which respect the *Matrix*, I have observed a wonderful contrivance in *Nature*: For in diverse of the Cavities, and *Cotyledones*, or Orifices of the vessels gaping outwards, I found a *white mucilaginous substance*, which did fill up the whole body of the *caruncle*, (as the *Honey* stuffs up the *Honey-comb*) and was of a complexion, consistence, and tast much like the *White* of an *Egge*. But if you pluck a sinder the *conception* from the *caruncles*, you shall presently descry so many *friggs*, or *capillary branches* of the *Vmbilical* vessels (which look like long threads or filaments) to be drawn out also from every one of the *Cotyledones*, and Combs as it were, and out of their *mucous substance*: just as Herbs plucked up from the Earth, have their *Roots* trailing after them.

By which it is evident, that the *Extremities* of the *Vmbilical* vessels, are no way conjoined to the *Vterine* vessels by an *Anastomosis*; nor do extract blood from them, but are terminated in that *white mucilaginous matter*, and are quite obliterated in it, attracting nourishment from it; after the self same manner, as they did formerly draw *Aliment* from the *white moisture* or *sap*, which was concluded within the membranes of the *conception*. And as the *chicken* in the *Hen-egge* is sustained by the *White* attracted by its *Vmbilical* vessels; so the *Conception* also of *Hinds* and *Does*, is nourished with a *white substance* like to that, which is stored up in these little Cells, and not with *blood*.

Wherefore these *Caruncles* may be justly stiled the *Vterine cakes*, or *dugs*: that is to say, Convenient and proportionate Organs or Instruments designed for the concocting of that *Albuginous Aliment*, and for preparing it for the attraction of the *Veins*. And therefore those *Viviparous Animals*.

nimals which have not these Caruncles or After-birth; (as the *Mare*, and the *Sow* have none) their *fetus* is sustained even till the hour of their *birth*, with the humours which are contained in the Conception onely; and their conception doth no where adhere or grow to the *Vterus*.

It is therefore manifest in those, and also in these sorts or species of Viviparous Animals, (and perhaps in all other whatsoever;) that the *Embryo* is in no other manner sustained in the *Vterus*, then the *chicken* in the *Egge*; but out of the same Nutritive substance, and of like kind to the *Aliment* in the *White* of an *Egge*. For as in an *Egge*, the extremities of the *Vmbilical* vessels are terminated in the *White* and *Tolk*; so likewise in Hinds and Does, and other Animals, that are furnished with these Caruncles, the extremity of the Orifices of the *Vmbilical* vessels are opened into, & terminated in the humour which is contained in the Conception; and in that white substance, which is found in those Orifices or *Cotyledones*.

And this truth is hence also asserted, in that the extremities of the threads or filaments of the *Vmbilical* vessels, when they are drawn out of that mucous or *white substance*, are all of them white likewise; which is a forcible argument they do onely imbibe this *gelly* or *mucilage*, and not *blood*. And any man may prove the same Experiment in an *Egge* also, if he desire it.

The *After-burden*, or *Vterine cake* of a Woman, is in its gibbous part, wherewith it respects the *Womb*, uneven, & hilly, by reason of several tumors or mushroom-like substances; and seems by their mediation to grow to the *Womb*. As if it were not fastned to the womb in every part, but onely in those places, where the vessels disseminated into it

it do extract *Aliment*, and in which for that cause, the *extremities* of the *vessels* are broken off. Now whether those *extremities* or *terminations* of the *vessels* do suck blood from the *Womb*, or rather some kind of concocted substance like to the *White* of an *Egge*, such as we perceive plainly in *Hinds*, and *Does*, I am not yet satisfied.

Lastly, (that the truth in hand may be certainly confirmed) if you squeeze those *caruncles* between your fingers; you may easily Milk as much of that *Nutritive juice* as a spoon can contain, out of any one of those *Caruncles*; (as out of a *Nipple*) without any appearance of *blood* at all; which blood you shall never squeeze from them though you force them never so much. Moreover, the *caruncle* thus milked & drained, doth contract it self, and flag, like to a *sponge* that is squeezed, and appears to be bored through with several *perforations*. So that by all signs and tokens it appears that those *Caruncles* are *Ubera Vterina*, the *Breasts* or *Vdders* of the *Uterus*, or the receptacles and store-houses of that *Nutritive white substance*.

At the end of *December*, these *Caruncles* do less firmly cleave to the *Vterus*, then they did before, and are with ease divided from it. And by how much the *fetus* doth improve, and grow neerer to the *birth*, so much the easier do those *caruncles* disjoin from the *Womb*: and in the end (as ripe fruit falls off from the *Tree*) they depart from the *Vterus* of their own accord, as being things which relate to the *conception*.

And when they are parted from the *Womb*, you may, in the impressions which they leave behind them, perceive the *points* or *terminations* of the *Arteries* which pass on towards them, breathing forth blood. But if you force the *conception* from the



the *caruncles*, no blood doth issue out from the impressions which they leave behind them: though it do seem more consonant to reason, that *blood* should issue out of the *caruncles*, then of the conception upon their divorce. For since the *caruncles* are embroidered by several propagations of *Arteries* derived from the *Vterus*; and are commonly conceived to convey *blood* for the nutriment of the *Fætus*, they ought in consequence to abound with plenty of *Blood*. And yet though you milk or compress them, they effund no *blood* at all; because they are not full of *blood*, but of this *white substance*; nor do they seem to be instruments instituted for the concoction of the former, but *Promptuaries*, or *Treasuries* of the latter. By which it is apparent, that the *fætus* in the *Womb*, is not sustained by the *Mother's blood*, but by this *white substance* fitly prepared. And perhaps even grown bodies are not nourished by *blood*, but something which runs in the *blood*, is their common and last *Aliment*: as shall perhaps be elsewhere discovered in our *Physiological Treatise*, and in the proper disceptation relating to the *blood*.

I do much question the truth of that place of  
*L. de nat. Hippocrates*, where he saith: *Those Animals whose*  
*Mul. de Acetabula or Orifices of their Vterine vessels are full of*  
*morb. vulg. a mucous substance, do suffer Abortment.* For that  
*Ex aphor. substance is not an Excrement, and cause of Aborti-*  
*45. on, but an Aliment and first cause of life.* But  
*Hippocrates* perhaps meant some other *Acetabula*: for in a *Woman* they are not found, nor hath her *After-birth* any such substance as this to be sensibly perceived in any of its *cavities*.

The Later *Physitians*, according to the opinion of the *Arabians*, do phantasie three several *Nutritive Humours*; namely, *Rorem*, the dewy substance

Ex.LXX. Conception in December.

443

stance, *Gluten*, the glutinous substance, and *Cambium*, the substance which is immediately transformed into the essence of the parts : and these *Fernelius* calls *succos Nutritios*, the alible juices ; as conceiving, that the Parts of our bodies are not immediatly nourished by the *Blood*, as its last aliment, but by these *secundary humours* : by the first whereof, as by a kind of Dew, all the smallest particles of the body and parts thereof, are sprinkled and bedewed ; which *humour* being thickned by a farther *concoction*, and sticking more firmly to the Parts, is now called *Gluten*, which at last being altered and assimilated by the power and virtue of the Parts, is called *Cambium*.

We may, according to these Mens conceit, call that substance which we finde in the *Acetabula*, or *Orifices* of the vessels, the *Gluten*, or *Nutritive white*, and say that it is (as being the last Aliment which is designed to all the severall parts of the *fætus*) proportionable to the *White* or *Yolk* of the *Egge*. For as we said ere-while, with *Aristotle*, that the *Yolk* is proportionable to *milk* : so we likewise conceive it consonant to reason, to affirm, that this substance, which is contained in the *Cotyledones*, or *Acetabula* of the *Uterine cake*, doth supply the office of *milk* to the *fætus*, so long as it continues in the *womb* : and consequently, that the *Carruncles* are as it were *Ubera interna*, internal Dugs, and that the *alible juice* is (after the delivery) transported into the *Breasts*, and there made *milk* ; that so the *fætus* may enjoy the same nutriment after he is born, wherewith he was fed when he continued in the *womb*. And therefore this onely difference is between the party-coloured Eggs of *Oviparous Animals* (which are compounded of the *Yolk* and *White*) and the Eggs or Conceptions of *Vivi-*

*Viviparous Animals*, that in the former, the *Talk* (which is their *secondary sustenance*) is provided for them within the Egg, and presently upon their Exclusion, is shut up within the belly of the *Chicken*, as being reserved there for their support; but in the latter, this *nutritive substance* is before the Birth preserved in the *Acetabula*, and after the Birth transmitted to the *Breasts* or *Udder*. So that the *Pullus* is supplied with a kinde of *milk*, which is concluded in it self; but the *Viviparous fetus*, sucks the same from the duggs of the *Dam*.

When *December* is ended, seeing that in the subsequent moneths of *January*, *February*, &c. there is nothing new or notable doth befall the *fetus*, but all its accessions have been observed already, (save onely the *Hair*, *Teeth*, *Horns*, and the like) onely the parts formerly described seem to have attained a larger Augmentation, litle or nothing respecting the busines of Generation, we conceive it useles to discourse any more of them at present.

But as to the Conceptions of *Ewes*, I have dissected divers of them about this time, which (like those of *Does*) did also resemble the figure of a *Wallet*, or *double-pudding*, being extended over both the *Horns* of the *Womb*. In some of these Conceptions I found two *fetus*; in other, one onely, and that void of all kinde of *wool*, with its eyes so congealed and fixed together, that I could not open the *lids*, and yet the *horns* were already made. Where there were two *fetus*, they lay in several *Horns* of the *Uterus*, and that promiscuously, without any order at all observed, the *male* being sometimes in the *left*, and the *female* in the *right Horn*, and sometimes clean contrary: but both were still encompassed in the same common

Conception,



*Conception*, and concluded in the same *exteriour membrane* called *Chorion*; whose *Extremities* or *ends* on both *Sides* towards the *termination* of the *Horns*, were stained as it were by a kinde of *cholericall excrement*, and did seem to have some *turbid* and *excrementitious* matter within them.

The *Caruncles*, or little *Cakes*, were diverse, and of a different *magnitude*, and of a distinct *figure* from the *caruncles* of *Hinds* and *Does*: for in *Ewes*, there is a kind of round *mushroom* with the stalk broken off, contained between the *Coats* of the *Uterus*, whose *gibbous Part* lieth towards the *Uterus*; (as it is also in the *Conceptions* of *Cowes*.) but the *concave* (which is smooth) towards the *fetus*: and likewise larger *Branches* or *Vessels* are derived to this *concave part*, as it also happens to the *interiour part* of a *Womans After-burden*.

The *Propagations* of the *Umbilical Vessels* being annexed to the *caruncles*, do grow so firmly to them, that when I endeavoured to divide them, the *gibbous part* would be sooner broken off from the *interiour coat* of the *Womb*, then recede from the *Conception*: contrary to their custom in *Hinds* and *Does*, whose *membrane* called *Chorion*, is easily separated from the *Cotylidones* of the *caruncles*; and the *convexe side* of the *caruncles*, which adhereth to the *Conception*, may be divided from it; but the *Concave part*, or *root* rather, or *stalk*, sticketh fast to the *Uterus*. But in other matters, the office is alike in all, and they have the like *Acetabula*, and an *Albugineous gelly* may in like manner be milked out of them, as out of these *caruncles* of *Cowes* also.

Where there is but one single *fetus* in a *Conception*, there that *fetus* doth transmit his *Umbilical Vessels* to all the *caruncles* of both the *Horns* of the

the womb, that so he may derive nutriment from both. But that Horn wherein the *fetus* himself (swimming in the *crystal water* which lies within the coat called *Amnion*) doth reside, is larger then the other. But where there are two *fetus* in one and the same Conception, there each of them are confined to their proper *caruncles*, and do transmit their *Umbilical Vessels* into their own proper Horn only, and receive their Nutriment from thence.

If it be a *Male fetus*, the Testicles are large (for it's time) hanging without in the *Scrotum*. If an *Ewe-lamb*, the Udder hanging in the same place, hath little Tets or Nipples, as Womens Breasts.

In the twofold *stomack* of the *fetus* (namely, the *Maw* and the *Dew-lap*) there appeared a *crystal water* like to that where he swam; for they did agree both in colour, sent, taste, and consistence: there was also in the upper *Guts* a substance like to *chyle*; in the lower, a green excrement, and dry dung, such as they use to eject when they graze: the *Liver* was something large, and the *Bladder* of Gall of an oblong figure, and in some of them it was quite empty.

But as to the order of the production of the Parts, we have still found the same to be observed in all *Viviparous Embryo's* whatsoever, as Experience hath revealed to us in that of the *EGGE*, the *Hinde*, and the *Doe*.

# Of the Innate Heat.

## EXER. LXXI.

BECAUSE there is much talk of the *Calidum Innatum*, or Innate Heat, we do intend in this place (by way of second course, or addition) to discourse a while concerning both it, and the *Humidum Primigenium*, the Radical or Primigenial moisture; and that the rather, because I perceive many men to please themselves much with those two Notions, when as (according to my judgement) they do not understand their meaning. The truth is, there is no need at all to enquire after any kinde of spirit distinct from the *Blood* it self, or to introduce any forraign heat, or invoke the *Deities* to appear in the fable, and so trim up *Philosophie* with vain opinions and fictions; for what we commonly derive from the *Starres*, is bred and born at home, and within us. For the *Blood* alone is the true *Calidum Innatum*, or first-born *Animal heat*: as it is made apparent by our observations concerning the *Generation of Animals*; (especially of the *Chicken* out of the *Egge*) and therefore to multiply Entities, is meerly frivolous. For, indeed, there is nothing either before, or more excellent in the *Animal body*, then *Blood*; nor are those spirits which some men distinguish from *Blood*, any where to be found apart from the *blood*; and the *Blood* it self, without spirit and heat, is no longer to be called *Blood*, but *Gore*. The *Blood*, De purt. an. l. 2 c. 3. saith *Aristotle*, is in a manner hot, and in such a manner, as it hath the essence of *Blood* in being hot: just as if we should express Hot water under one word: but yet



yet being considered as the subject of Heat, and such a substance, as when it is in being, is Blood, so it is not hot: for it is in some respect hot per se, or essentially, & in some respect it is not hot per se; for Heat is of its essence, as Whiteness is of the essence of a white man: but forasmuch as it is blood, in relation to Action or Passion, so it is not calidus per se, or essentially hot.

We Physicians call that *Spiritus*, a Spirit, which Hippocrates called *Impetum faciens*, that is, whatsoever doth attempt any thing *proprio conamine*, by its own proper endeavour, and doth set upon any action, or excite any motion with agility and vehemence: and under that capacity, the spirits of Wine, or of Vitriol, are called spirits. And hereupon Physicians count as many spirits, as principal parts, or operations; namely, *Animal*, *Vital*, *Natural*, *Visory*, *Auditory*, *Concoctive*, *Generative*, *Implanted*, *Influent Spirits*, &c. But the Blood (the primogenit and principal part of the Body) is furnished with all these respective qualities, and endowed with active power beyond all other parts of the body, and doth therefore deserve the name of a spirit *ut' i' Exo<sup>dr</sup>*.

Scaliger, Fernelius, & others, having not thoroughly considered the excellent endowments implanted in the Blood, have phansied other *Aerial* or *Ætherial* spirits, composed of an *Ætherial* and *Elementary* substance, to be a more excellent and diviner Innate heat than blood; which they conceited to be the most immediate instrument of the Soul, most proportionable to all its operations: grounding their opinion upon this opinion; namely, that the Blood (as being a substance compounded out of the Elements only) cannot perform any action beyond the sphere or activity of the Elements, and such bodies as are framed out of them. Hereupon they

they feigned a distinct spirit, and innate heat, which is of a celestial extract; namely, a most simple, most subtle, most thin, swift, lucid, and ætherial substance, partaking of a fifth essence. But yet they have no where demonstrated that there is any such substance, or that it doth act beyond the power of the Elements, or execute greater things than the Blood alone is able to accomplish. But we, who examine the nature of things according to sense, have never discovered any such substance. Nor are there in the Body any receptacles designed to the conservation, or generation of such matters, and they themselves also have not assigned any. Fernelius, indeed, saith, That whosoever hath not yet attained to the knowledge of the substance and condition of the Innate Heat, must first consider the structure of our bodies, and then address himself to the arteries which are seated in the cavity of the Heart, and to the Ventricles of the Braine; which when he shall discover void and empty, and without any humour contained therein, yet can be not imagine that such worthy matters are made by Nature rashly, and to no use: and upon this consideration, I conceive, he will presently conclude, that while the Animal was alive, they were replenished by some thin Aerial substance, which when the animal Soul departed, being exceeding light, did insensibly vanish. Now, to support this substance, the faculty of Inspiration is bestowed upon us, which doth not onely coole the body (for that might be derived to us by other meanes) but also administer a kinde of nourishment. But we affirm, that (so long as the Animal is alive) the Arteries & Ventricles of the Heart, are filled with blood; reputed the Ventricles of the Brain, to be too mean instruments for so noble a work, conceiving them rather allotted to the reception of excrements. For, what



shall we say of those several Animals, whose Brain hath no *Ventricles* at all? And though we should admit, that a kinde of *Aire* or *vapour* may be there found (because *Nature* doth decline a *vacuity*) yet that that substance is of a celestial extract, and heir apparent to such excellent performances; hath no semblance of truth at all. But that which we most admire, is, How this so exquisite, so divine a *Spirit*, should be sustained and fed by our common *elementary aire*? especially, since themselves assure us, that none of the *Elements* can perform any thing beyond their own abilities.

These men do likewise confess, that the spirit is in continual declension, and quickly dissipated, and corrupted, and that it could not subsist one moment of time, were it not repaired by the plentiful accession of outward aliment; and that therefore like the *Primum Vivens*, the first particle inspired with life; it must continually be fed. And now what need of this forraigh guest, this *Innate Spirit*, or *etherial heat*? Since the *blood* is of ability to execute whatsoever is attributed thereunto; and since these spirits cannot recede from the *blood*, (without their dissolution) Nay they do not move any whither, or insinuate themselves into any part (as distinct bodies) without the company of the *blood*. For whether you conceive them to be framed, nourished, and increased out of the thinner part of the *blood*, (as some imagine) or out of the *primigenial moisture* (as others) yet all confess that they are no where to be found out of the *blood*, but that they continually cleave to the *blood*, as to their support (as the *flame* cleaveth to the *oyle* in the *lamp*.) And therefore their *tenacity*, *subtlety*, and *mobility*, &c. are of no more use then the *blood*, whose inseparable companions they



they are. So that the *blood* is sufficient, to become the proportionate and immediate instrument of the *Soul*; because it is every where present, and doth fly to and fro with an admirable agility. Nor are there any other bodies, or *spiritual incorporeal qualities*, or any *diviner heat* to be allowed of, (as *lux & lumen*, the *Light*, and *Shine*) as *Cesar Cremoninus* (a man excellently versed in *Aristotles Philosophy*) doth solidly contend against *Albertus*.

Disputo. 7.

If these men pretend, that these *spirits* do reside in the *primigenial moisture*, as in the last *Aliment*; and from thence insinuate themselves into the whole body, thereby to nourish all the *parts*; they then conclude upon an impossibility, namely that the *Calidum Innatum* the *Innate Heat*, which is the *primigenial part* of the body (and stands it self in need of sustenance) doth nourish the *whole body*. For upon this account, the same thing is both the thing that is nourished, & also the thing by which it is nourished; and the self same substance, under the same respect, should both feed it self, and be fed also, which is indeed impossible: for in probability the thing which doth feed, and the thing which is fed, are not so much as mixed together: for miscible things must be of equal power, and operate one upon the other. And *Aristotles* position is, *Ubi nutritio, ibi nulla mistio est*, Where there is *Nutrition*, there is no *Mistion*. For where-soever *Nutrition* is, there the *Aliment* is one thing, and the thing nourished another; and a necessity of the transmutation of the one into the other.

But whereas they conceive that the *Spirits*, and the last or *primigenial Aliment*, or some other thing what ever it be in an *Animal*, can (more then the *blood*) operate above the power of the *Elements*; they seem not to understand what it is to operate

above the power of the Elements: nor do they rightly interpret that place of Aristotle, where he saith: Every vertue or faculty of the Soul, seemeth to partake of another substance, and that more divine, then those substances which are called Elements. And likewise where he saith, There is a certain thing in the seed of all things, causing them to be fruitful, which thing is called heat, which is not fire, nor no such faculty, but a spirit which is contained in the seed and frothy body, and the nature which is in that spirit is answerable in proportion to the Element of the Stars. For fire doth not generate any Animal, nor doth any thing seem to be constituted by thick, moist, or dry qualities. But the heat of the Sun, and of Animals, not that onely which is contained in the seed, but also whatsoever excrement there be, though of a different nature, yet even that also hath a vital principle. Wherefore it appeareth by what hath been said, that the heat contained in Animals, neither is it self fire, nor doth take its original from fire. For I also do affirm the same of the Innate Heat, and of Blood, namely that they are not Fire, neither do they take their original from fire, but do partake of a different, and more divine substance then fire is, and therefore do not act by any elementary faculty; but as in the seed there is something which doth make it fruitful, and exceeds the vertues or powers of the Elements in constituting an Animal body; namely the spirit and the nature which is in that spirit, answerable in proportion to the element or substance of the Stars.

So likewise in the Blood, there is a spirit or vertue, which doth act above the power of Elements (most conspicuous in the nutrition or preservation of each particular part) and also a nature, nay a soul in that spirit and blood answerable in proportion

on

on to the *Element* of the *Stars*. And lastly, it is most evident, and my observations do plainly shew it, that there is a *Heat* in the *Blood* of *Animals* (whilest life continueth) which is neither fire, nor doth derive its original from fire.

But for the clearer illustration of these matters, give us leave to digress a while from our purpose, and declare briefly, *what a spirit is, and what it is to act above the power of Elements*, and likewise what is meant by these words, namely, *to partake of a different body, and that more divine, then those bodies which are called Elements*: as likewise what is that nature in that spirit which is answerable in proportion to the element or substance of the *Stars*. What *A Spirit*, and *Vital principle* is, we have partly spoken already, and shall now handle something more largely. There are three several (simple) bodies, which do chiefly seem to challenge the name, or function at least of a *spirit*; namely, the *Fire*, the *Aire*, and the *Water*; and every one of these doth seem to partake of a *life*, or other *body*, by reason of their perpetual motion and flux; (I mean) the *Flame*, the *Wind*, and the *Flood*. The *Flame* is the *Flux*, or *Stream* of *Fire*, the *Wind* of *Aire*, and the *Flood* of *Water*. *Flame* like an *Animal*, doth move it self, nourish, and increase it self, and is an Embleme of *humane life*. And therefore it is much used in *divine Ceremonies*: and was religiously kept (as a sacred thing) in the *Temples* dedicated to *Apollo*, and *Vesta*, by *Virgins*; and amongst the *Persians*, and diverse other *Nations*, it was from all *Antiquity* honoured with *divine worship*. As if *God* were more visible in *Fire*, and did converse with us, (as heretofore with *Moses*) out of the *Fire*. The *Air* also seems to merit the name of a *spirit* too, for a *spirit* is called *spiritus a*



De gen. an.  
l. 4. c. ult.

*Spirando*, from breathing; and *Aristotle* confesseth in plain tearms, that there is a kind of life and death of *Winds*. And lastly, the Water of the Flood or River, is called *Viva*, living Water. Those three bodies therefore (in as much as they enjoy a kind of life) do seem to operate above the power of Elements, and so partake of a diviner body or substance, and hereupon were by the Heathen ranked amongst the gods, who conceived that whatsoever did perform any eminent effects, which did surpasse the naked abilities of the Elements, those effects did proceed from some diviner Agent. As if it were the same thing, to act above the power of the Elements, and to partake of a more divine essence, which did not deduce it selfe from the Elements.

Thus in like manner the *Blood* doth act above the Power of the Elements, when now being the *Primogenite part*, and *Innate Heat* (as it is in the Seed, and in the Spirit) it doth constitute the other parts in order; and this with an eminent providence and understanding, acting in order to a certain end, as if it did exercise a kind of *Ratiocination* or discourse. For it doth not these offices as it is *Elementary*, and deriveth its original from Fire, but in as much as it is made the *Primigenial Heat*, and most immediate and convenient instrument of life it self, by being impowred by the *Plasfical virtue*, and function of the *Vegetative Soul*. *Αἷμα, τὸ κοινὸν τῷ ἀνδρὶ καὶ τῷ ὄρνιθι*, the Blood is the Vegetal part of Man, saith *Suidas*, which is true also of all other Animals. And *Virgil* seemeth to have intended as much, where he saith:

XXI. Ex. LXXI. Of the Innate Heat.

455

—Una eademq; via sanguisq; Animusq; sequuntur : *Ænead.*  
Both Soul and Blood  
Stream in one Flood. 10.

The Blood therefore is a *Spirit*, in regard of its excellent power and virtue; and also *celestial*, because the Soul is an *Inne-mate* in that spirit, which Soul is of a nature answerable in proportion to the Element of the Stars; that is, something which beareth an *Analogy* to the Heavens, as being the Instrument and Deputy of the Heavens.

And so in this manner, all natural bodies fall under a double consideration; namely, as they are considered, in their private capacity, concluded within the bounds of their own proper nature; or else, as they are the Instruments of a nobler Agent, and superiour power. For being considered in their own proper abilities, it is perhaps no question, but that being all subject to generation and corruption; they do derive their original from the Elements, and act according to their rule: but being considered as they are the Instruments of a more worthy Agent, and regulated thereby, they do not now act of themselves, but by the guidance of another; and thereupon seem to participate of another more divine Essence, and so exceed the power of the Element.

So likewise the heat of the blood is an animal heat, inasmuch as it is guided in its operations by the soul; and also a Celestial heat, as being subservient to the Heavens; and lastly, a Divine heat, in that it is the Instrument of Almighty God: as we have formerly said, where we also did demonstrate, that the Male and Female, are the Instruments of the Sun, the Heavens, and of God himself, as being subservient to the generation of Animals.

The *Inferiour World*, according to *Aristotle*, is so continuous to the *Superiour Orbes*, that all its motions and mutations do seem to borrow their original, and regulation from them. And truly in this World (which the Greeks call *κόσμος*, from the beauty of its order) the inferiour and corruptible things are subservient to the superior and incorruptible; and yet they all are obedient to the will of the Almighty and Eternal Creator.

They therefore who conceive that in a body compounded of the *Elements*, it cannot act beyond the power of the *Elements*; except it do also participate of another more divine body; and upon that ground, do suppose those *Spirits* whereof they treat, to be constituted partly out of the *Elements*, and partly out of a certain *Ætherial* and *Celestial substance*, do seem to have built their reasons upon a very shallow foundation. For you can hardly finde out any *Elementary body*, which doth not in its actions surpass its own proper power. Not to seek farre for an instance, which is every where obvious; the *Aire* and the *Water*, while they carry ships to the farthest *Indies*, and round the world; (and many times also into contrary parts) while they Grinde, Bake, Sift, drain deep Wells, cut Timber in sunder, kindle fires, bear up some things, and overwhelm others, and perform many other innumerable and wonderfull offices, do they not seem to act above the power of *Elements*? So, also *Fire*; how many, and how strange employments doth it undergo? viz. in the *Kitchen*, and also in the *Shops* of such as deal in *Mettles*, and in the *Chymists* furnace, by *sublimation*, *fusion*, *concoction*, *corruption*, *coagulation*, and infinite other uses. What shall we say of it, when Iron it self is produced by its assistance,

quod



— *quod terram domat, & quatit oppida bello?*

Which tills the Field,

And makes Towns yeild.

When the Load-stone (to which *Thales* did there-  
fore ascribe a *Soul*) draws Iron unto it, and that  
Mettle which subdueth all opposers, (as *Pliny* speak- *L. 36. c.*  
eth) pursueth after I know not what vanity; and the 16.

Needle also being only touched by this Loadstone,  
doth still direct it self towards the Poles of the  
world. When our Clocks do faithfully strike all  
the houres both of Day and Night, do they not seem  
to partake of another Body, (besides the Elements)  
and that more divine then the Elements? Since  
then such excellent Operations are produced by  
the dominion and sway of Art; which operations  
do farre exceed the power of the Materials them-  
selves; what shall we then think may be produ-  
ced by the prescript and regiment of Nature,  
whom Art doth onely imitate? And if they effect  
such wonderfull things in obedience to Men,  
what performances may we expect from them,  
when they are instruments in the hands of God him-  
self.

In short therefore, this distinction is necessary,  
namely, that no Primary or first Agent, doth act  
any thing beyond its own power: but every In-  
strumental Agent, doth exceed its own power; for  
it acts not onely by its own power, but also by the  
virtue of the superiour efficient.

They therefore which deny such eminent en-  
dowments to the blood, and flye up to Heaven to  
fetch down I know not what Spirits, to whom  
they may ascribe those divine operations: they do  
not know, or at least do not consider, that the  
work of Generation (and of Nutrition also, which  
is indeed a Species of Generation) for whose sake  
they

they attribute such notable prerogatives to those *Spirits*, doth much exceed the power of those *spirits* themselves: & not of those *spirits* only, but even of the *Vegetal Soul*, nay of the *Sensitive*, & in a word, of the *Rational soul* her self, and not the power only, but the very apprehension of the *Rational soul*; for the *Nature* and *Order* of *Generation*, is truly admirable and divine, beyond the comprehension and grasp of our thoughts, or understanding.

That it may therefore more clearly appear, that those eminent attributes which learned men bestow upon the *Spirits*, and the *Innate Heat*, do belong to the *blood* alone; These few following considerations do offer themselves, over and above those things, which are wonderfully evident in an *Egge* (before any rudiment of the *Chicken* appear) and also in a perfect and adult *Fetus*. Namely, that the *blood* being considered absolutely in it self out of the *Veins*, as it is an elementary substance, and composed of several parts (namely, of serous, thin, crass, and concrete parts) is called *Cruor*, *Gore*, and doth possess a few onely, and those obscure abilities. But being in the *veins*, as it is a part of the body, and that also an *Animate*, and *Genital* part, and the *Immediate Instrument*, and *primary seat* of the *soul*: and also as it seemeth to partake of another more *divine* body, and is inspired with a *divine animal heat*; it is then endowed with excellent abilities, and answerable in proportion to the *element* of the *Stars*. In as much as it is a *Spirit*, so it is the *Fire*, the *Vesta*, the *Household deity*, the *Calidum Innatum*, the *Sun* of the *Microcosme*, and *Platoes Fire*; not because (like ordinary fire) it *shineth*, *burneth*, and *destroyeth*: but because it doth *conserve*, *nourish*, and *encrease* it self, by a free perpetuall motion. It doth

doth also challenge the name of *Spirit*, in as much as it doth primarily, and before the other parts, abound with *Radical moisture*, which is the last and neereſt aliment thereof, and doth diſpence and provide the ſame ſuſtenance for all the reſt of the parts; wherewith it ſelf is ſupported: namely while it doth nimblely dart it ſelf through the *whole body*, and nourish, cheriſh, and keep alive all the parts thereof, (which it ſelf doth firſt frame, and adjoin to it ſelf) after the ſame manner as the ſuperiour Orbes (but eſpecially the *Sun* and *Moon*) do, by their *continual motions*, quicken and preſerve the *inferiour world*.

Seeing therefore that the *Blood* doth aſt above the power of the *Elements*, and is inſpired with ſuch notable virtues, being alſo the *Instrument* of the *Omnipotent Agent*; no man can worthily magniſie and extol its wonderful and divine faculties. In it the *soul* doth firſt, and principally reſide, and that not the *Vegetative ſoul* onely, but the *Senſitive* and *Motive* alſo; it penetrates every part, and is every where preſent; and that being taken away, the ſoul is preſently gone: ſo that the *blood* ſeems to differ nothing from the *soul*; or ought at leaſt to be counted that ſubſtance, whoſe aſt the *soul* is. For ſuch is the *soul*, that it is not altogether a *body*, nor yet wholly without a *body*; it comes partly from without, and is partly born at home: in ſome ſort it is a *part* of the *body*, and in ſome the beginning and cauſe of all things which are contained in the *Animal body*; namely, *nutrition*, *ſenſe*, and *motion*; and ſo conſequently of *Life*, and *Death* alſo: for whatſoever is nourished, doth alſo *live*; and ſo on the contrary. Like- wiſe whatſoever is plentifully nourished, is alſo enlarged; but that which is too ſparingly nourished



ed, doth diminish: that also which is perfectly nourished, doth continue in health, but that which is not, doth incline to diseases. The *blood* therefore, as well as the *soul*, is to be reputed the cause and author, both of Youth, and Old Age, of Sleep and Waking, and of Breathing also: especially since in Natural productions the first Instrument doth contain in it self the internal moving cause. And therefore it comes all to the same reckoning, whether we say, that the *soul* and the *blood*, or the *blood* with the *soul*, or the *soul* with the *blood*, doth performe all the effects in an *Animal*.

We use, as persons that neglect the things themselves, to pay much reverence to the specious names. The *blood* which is still at hand, and daily in our view, makes no great noise in our ears; but at the magnificent name of *Spirits*, and of an *Innate Heat*, we are strangely amused. But when once the vizour is plucked from before them, as our error, so our wonder ceaseth. That miraculous Stone, rendered so venerable to *Mizaldus* by the commendation of *Pipinus*, did not onely fill him with admiration, but *Thuanus* also: (who was an eminent *Historiographer* in his time) I shall here adjoin the Riddle it self. I saw, saith he, a Stone which was lately brought hither to our King out of the East Indies, which Stone did dart forth light, and brightness, after a wonderful manner, sparkling and shining with so much incredible lustre, as if it were all burning, and in a flame. This stone doth by his rayes scattered into every corner, illustrate the ambient aire with so clear a shine, that the firmest sight is scarce able to behold it. It is also most impatient of earth: for if you attempt to cover it, it doth of its own accord, with an impetuous violence fly upward.

Al

All the Art of man cannot confine and shut it up into a narrow room, for it seemeth to be affected with free & open places onely. The infinite purity, and brightness thereof, is not tainted by the least spot, or blemish. It hath no certain shape or figure, but varieth, and is altered in an instant. And though it be most faire and beautiful to the Eye: yet will it not endure to be touched: and if you attempt too long to handle it, and continue too obstinate in your resolution, it will mischief you: as many in my presence have deerly found. And if any thing be by violence taken from it, it remaines for all that (which is very wonderful) nothing less then it was before. The stranger who brought it, addes farther to all this, that its virtue and power is exceeding useful to sundry employments, but will not discover them without a great reward.

This traveller also might have added to his description, that this Stone is neither soft nor hard; that it puts on several shapes and complexions, that it hath a continual trembling and palpitation, and doth like an *Animal* (though it be an *Inanimate* thing) daily devour great store of food, converting it to its own nutriment and augmentation: and that he hath been told by men of good credit, that this Stone did long ago fall down from heaven, and is to this day the cause of *Thunders* and *Lightnings*; being some times begotten by the refraction of the *Sun-beams* through the *Waters*.

Who can but admire so strange a Stone, and conceive less of it, then to be above the power of the *Elements*, and so to partake of another body, and of an ethereal spirit, especially when he finds that it is answerable in proportion to the *Element* or *substance* of the sun himself. And yet if *Ferne-De abd.*  
*lius* may be the *Oedipus*, all this is but a Riddle of *rer. caus.*  
the Flame. In l. 2. c. 17.

In like manner, if I should describe the *Blood* under the veil and covering of a *Fable*, calling it the *Philosophers Stone*, and displaying all its endowments, operations, and faculties, in an *enigmatical* manner; doubtless every body would set a greater price upon it, and believing it to act beyond the *Activity* of the *elements*, would ascribe another and more divine body unto it.

### Of the Primigenial Moisture.

#### EXER. LXXII.

WE have now adorned the *Blood* with the Title of *Calidum Innatum*; and do likewise conceive it proper, to dignifie the *Colliquamentum Crystallinum*, as we call it (out of which the *fetus*, and its first parts do immediately arise) by the name of *Humidum radicale & Primigenium*, the Radical and Primigenial moisture. For we meet with nothing in the *Generation* of *Animals*, to which this title doth upon better right belong.

We have stiled it the *Radical moisture*, because out of it the first particle of the *fetus*, namely the *Blood*, and all the *post-genit* parts do arise, as out of their *Root*; and do owne the same, as the matter out of which they are procreated, fed, increased and conserved.

We likewise call it *Primigenial*, because it is first generated in the constitution of every *Animal*, and is as it were the foundation of all the other parts: as is evident in an *Esse*, in which after a short time of *Incubation*, it doth approve it self to be



Ex.LXXII. Of the Primigenial moisture.

463

be the first production of the implanted fructifying, and generative faculty.

It is likewise the most simple, pure, and sincere body imaginable: wherein all the parts of the *Chicken* do abide in *potentiâ*, but none, *actu*: nature seeming to have afforded to it the same privilege which men commonly ascribe to the *materia prima*, or first Matter, for which all things spring; namely, to be capable of all formes, potentially, but to possess none, actually. So the Crystalline humour of the Eye, to the intent that it may be susceptible of all Colours, is it self void of all: and in like manner the Mediums, or organs of each particular sense, are quite destitute of the qualities of sensible things, or objects: namely the Organs of Hearing and Smelling, and the Air which is subservient unto them, are without all Sound or Odour: so likewise, the moisture of the tongue and mouth, is of it self inspid. And upon this Argument chiefly doe they rely, who constitute *Intellectum possibilem incorporeum*, a Potential Understanding which is incorporeal, namely, because it is susceptible of all formes without matter; and as the Hand is called *Organum Organorum*, the instrument of instruments, so they affirm that to be *formam formarum*, the Form of forms, having no matter at all, but being altogether Incorporeal, and therefore they assert it to be *Possibilis*, Potential, but not *Passibilis*, passible. And this moisture also doth seem, if not the same, yet proportionable to the last Aliment, whereof Aristotle doth teach that the Animal Geniture or Seed is made. I say the last Aliment, which the Arabians call *Ros*, the Dew, wherewith all the parts of the Body are moistned and bedewed. For as that dew doth by farther condensation and adhesion pass into the alible glutten

ten, or glewey substance, and Cambium, which is that substance which doth constitute the parts of the body: so on the contrary, in the first generation and nutrition, out of the glutinous substance dissolved and rarefied, is made a Dew: namely, out of the White of an Egge is the Colliquamentum framed; which is the radical moisture, and Ros primigenius, the primigenial Dew. Nay if there be any faith due to our observations, the matter is the selfe same in both; and that is a truth which all Philosophers consent in, and Physitians do not dissent, namely, that an Animal is nourished by the same thing whereof it is made; and augmented by that out of which it is generated. So that Ros nutritius, the nutritive Dew, doth differ from the Colliquamentum, or primigenial moisture, onely under the severall respect of that which is first, and that which is after: in that this is concocted and made by the Parents, and that by the Fetus it selfe: and both the juices are the next and immediate aliment of the Animal: yet not the first aliment; according to that saying, *Contraria ex contrariis augeri necesse est*, Contraries are necessarily encreased out of contraries; but the last (as I have said, and as Aristotle also doth denote) according to that other saying, *Similia ex similibus*, Like are fed by like. And both these humours doe stand in that *proxima potentia*, that next or most immediate capacity or potentiality, by which (all impediments being removed) they are ready of their own accord, or by the law of nature, to pass or be transformed into all the parts of the Body.

Which things being so, all the controversies which doe arise concerning the matter, and aliment of Animals, seeme to be easily reconciled. For

## Ex. LXXII. Of the Primigenial moisture. 465

For whereas some were of opinion, that the seed, or matter ejected in coition was deduced from all the parts of the body, and that therefore the child had the resemblance of the Parents imprinted in it, Aristotle saith thus : We must be of a different judgement from the Ancients : for whereas they doe own that to be the seed which is discharged from the whole body ; we conclude that to be the seed, which of its own inclination doth conduce to the constitution of the whole body : and whereas they call it a Colliquamentum, or melted substance, we rather stile it excrementum, an excrement ; (but he had a little before said, I call an excrement the reliques of the aliment, and a Colliquamentum, that which is separated from the excrement by a præternatural resolution :) for that which commeth last to the parts, and is the excrement of that last aliment, is in probability a like substance. As Painters have commonly some remnant of those colours, which they have spent upon their Pictures : but now that which doth melt away and dissolve, doth corrupt and degenerate. One Argument to prove that the excrement is rather the seed, then any colliquated matter, is this ; namely, that those Animals which are of great growth, are less fruitfull ; but little Animals are most of all fertile. For there must of necessity be more dissolved matter in great Animals, but less excrement : for the stock of aliment is wasted in the support of a large bulk ; and thereupon there is little excrement. Moreover, there is no place designed by nature for the reception of that substance or matter which doth melt off from the body : but there is a place assigned to all the natural excrements : as for example, the Guts are intended for the excrements of the dry aliment ; the bladder of urine for the moist ; the stomach for the profitable or usefull excrements ; and the Womb, the Genital parts,

H b

and

De gen. an.  
l. 1. c. 18.



and the Breasts, for the Seminal: for unto those places they resort, and assemble themselves. Likewise by several other arguments he proceedeth to maintain, that the seminal substance, out of which the *Fetus* is framed, is the same with that which is provided for the nourishment of the parts. As if a man should desire a little colouring from a Painter; surely the Painter would not scrape off that colouring which he hath already laid upon his Picture, but afford him some of that which remains, and this supernumerary stuffe is of the same nature with that which he hath expended upon his Picture. So likewise the Excrement of the last Aliment, or the Reliques of that nutritious substance which is called *Ros*, and *Gluten*, is deposited in the Genetal parts: and this opinion is most agreeable to the Generation of the Egges in the Hen.

Physicians also (who conclude that all the parts at the beginning are made out of seed, or *Sperme*, (and upon that ground call them *spermatical parts*) do affirm that the seed is by the power of the Genetal parts made out of the last aliment (which they with *Aristotle* conceive to be blood) and so doth constitute the matter of the *Fetus*. It is indeed a plain case, that the egge is produced by the Hen, and from her last aliment (namely, her *Ros nutritius*, her nutritive juice.) The White therefore of an Egge, or that *primogenit*, or rather *antegenit coagulamentum*, or melted substance, is to be reputed the truer seed of the Hen (though it be not ejected in coition, but provided ready before coition, or else collected after it; (as shall be perhaps more largely declared, to be incident to several Animals) which the geniture of the Male, doth according to *Aristotle*, coagulate.

Since

Ex.LXXII. *Of the Primigenial moisture.* 467

Since therefore I plainly see, that all the parts are fashioned and fed by this one moisture onely, (as the matter and first root of all) and since the fore-cited argument doth necessarily conclude as much; I can scarce refrain my pen from rebuking those that follow *Empedocles* and *Hippocrates* also: (who will needs have all similar bodies to be generated by the congregation of the four contrary Elements: (as being mixt bodies) and dissolved or corrupted by their segregation) nor is *Democritus* and the *Epicureans*, who follow him, less blameable, who constitute all things out of the confluence of *Atomes* of different Figures. For it was their error of old, and is a popular error at this day, that all similar bodies are framed out of heterogeneous or different bodies. For according to this opinion, had a man *Linco* his eyes he could not discern any thing that were similar, one in number, identity, and continuity: but there were nothing but an appearing union, and an assembly or heap made up of a congregation and certaine colligation of indivisible bodies: so that generation were nothing else but an aggregation, and convenient posture of several parts.

But for my part, neither in the production of Animals, nor in the generation of any similar body whatsoever, (whether it were of the parts of Animals, Plants, Stones, or Minerals, &c.) I could never discover any such congregation, or any several præexistent miscible bodies, which were to be united afterwards in the work of Generation. Nor (so far as I could ever yet perceive, or by any meanes observe) are there any similar parts which are first constituted in their several order, or existence at the same time together (as mem-



branes, flesh, fibres, gristles, bones, &c.) that so from them conioined together (as out of the *Elements* or first rudiments of *Animals*) the organs or parts, and the whole entire animal should at last be framed; but as we said before, the first rudiment of the body is onely a similar soft gluten, or stiff substance, not unlike a spermatical concernment, or coagulated seed: out of which (the decree of Generation going on) being changed, cut in sunder, or distributed into severall parcels, as by the divine Mandat as we have said, (let here be a Bone, there a Nerve, or a Muscle, here the Bowels, the receptacles of the Excrements, &c.) out of an inorganicall substance, was made an organicall: out of one, and that one being of the same nature, were many things made, and those also diverse, and contrary: not by a kind of transposition, or local motion (as if by the virtue of the heat, there did arise a congregation of homogeneous, and a disgregation of heterogeneous bodies) but rather by a disgregation of homogeneous parts, or bodies, then any composition of heterogeneous.

And this do I believe to be observed in every Generation; so that the Similary mixt bodies have not their *Elements* existent in time before them, but are rather themselves in being before their *Elements*, (whether you understand by *Elements* the Fire, the Aire, the Earth, and the Water, with Empedocles, and Aristotle; or the Salt, the Sulphur, and the Mercury, with the Chymists; or the *Atomes* with Democritus) as being in Nature more perfect then they. There are I say mixt and compounded bodies, even in respect of time before any *Elements*, as they call them, into which they are corrupted and determine; for they are dissolved into those elements rather in order to our apprehension,



Ex. LXXII. Of the Primigenial Moisture. 469

hension, then really and actually. And therefore those bodies called *Elements*, are not before those things which are made and generated; but rather after them, and their Reliques rather than their Principles. Nor doth *Aristotle* himself, nor any other *Philosopher*, demonstrate that the *elements* do subsist apart, or are the Principles of similar bodies.

Indeed *Aristotle*, where he goes about to prove, L. 3. de  
caelo. c. 3<sup>10</sup> that there are such things as *Elements*, seems to waver in his judgement, whether he should resolve that they were *actually* in being, or only *in potentiâ*: and doth conceive that in natural things they are *in potentiâ* rather than *actû*: and therefore he affirms that there are such things as *Elements*, out of the *division, segregation, and solution* of things. And yet that is but an infirme argument, namely, that natural bodies are generated or compounded first out of those things, into which they are at last dissolved and corrupted: for by that argument, somethings should be compounded of *Glasse*, of *Askes*, and of *Smoak*; (because we see them reduced at last into such bodies) and since *Artificial Distillation* doth clearly demonstrate, that so many several Vapours or Waters, and those all of them of different Species, are extracted out of so many several bodies; the number of the elements ought to multiply *in infinitum*. Nor doth any *Philosopher* say, that the *Bodies* which are dissolved by *Art*, and are called *Sincere Bodies*, and *indivisible in species*, are more *single elements*, than the *Aire*, *Water*, and *Earth*, which we perceive by *Sense*, and are obvious to our eyes.

And lastly, we do not see that any thing is naturally produced out of *fire*, as a *miscible substance*;

De gen. &  
corr. l. 2.  
c. 50.

and perhaps it is altogether impossible there should; since fire (like a kind of living body) is in continual flux, and seeketh sustenance whereby it may be nourished, and conserved: according to that of *Aristotle*; that fire onely is nourished, and that chiefly because of its form. But whatsoever is nourished, cannot possibly be it self mixed with its nutriment. Whereupon it followeth, that it is impossible for Fire to be miscible. For *Mistion*, according to *Aristotle*, is *miscibilium alteratorum unio*, the union of miscible things altered; where one miscible thing is not transformed into another, but both of them being both *active* and *passive* in regard of themselves, do constitute a third thing: but generation (especially that which is by a *Metamorphosis*) is the distribution of one similar thing which is to be altered into diverse more. Nor are mixt similar bodies said to be generated out of the *Elements*, but in some sort to be constituted out of them: into which also they are capable to be dissolved.

But these matters do properly relate to that part of *Physiology*, which treateth of the *Elements*, and the *Temperaments*: where also we shall discourse more copiously of them.

## Of the Birth.

**A**fter the Generation, the Birth succeedeth, by which the *Fætus* comming into the world, doth enjoy the outward *Aire*. Whereupon we conceive it convenient to speak something concerning it. And therefore (with *Fabricius*) we shall consider the *Causes, Manner, and Times of Birth*; as also those things which are precedent and subsequent thereunto.

Those things which are incident a litle before the *Birth*, and especially to *Women*, presaging the approaching delivery, are in part the preparation and disposition of the *Childing Woman*, whereby she may bring forth: and in part the scite, or proper position of the Infant in order to the Birth.

As concerning the *Position*, *Fabricius* saith, *that it is of a conglobated and inflex figure, lest the Fœtus by his extreame and eminent parts, might injure the Womb, or the conteining membranes: and likewise that so he may be comprehended in the lesser roome.* But I am not of opinion that the *fœtus* doth still observe the same scite or posture of his members in the Womb, (for the fore-scited causes.) For he swimmeth in a water, and moveth himself to and fro, he stretcheth himself, now this way, and anon that, and so is variouly inflected, and tumbled up and down; in so much that sometimes being entangled in his own *Navel-string*, he is strangely insnared. True it is that all *Animals*, while they lye still and sleep, do for the most part draw in, and contract themselves, and direct themselves toward an Oval or Conglobated figure. So likewise *Embryo's*, which pass their time

De form.

Fœtus c. 9.

pag. 140.

The Position of the

Fœtus in the Womb.



overlooked in  
 respect of it self  
 the legs, legs.

most in slumbers, do compose their bodies in that posture wherein they are formed : (as being the most natural, most easie, and most advantageous for their sleep.) And therefore the Infant in the Womb is commonly found, with his Knees drawn up to his Belly, his Thighs bent backwards, his Feet hanging down, and his Hands elevated to his Head, whereof the one is placed about his Temples or Ears, and the other at his Cheek; in which parts there are white spots discovered in the skin, as being the signes of his confection : His Spine is bent round, and his Neck being inflected, his Head hangs neer his Knees. The Embryo is scituated with that position of parts, wherewith we commonly apply our selves to rest, with his Head uppermost, and his Face directed towards his mothers Spine. But a litle before his Birth, his head being bent downwards, he dives towards the bottom, and the Orifice of the Matrix, (as if he were seeking his way out.) So Aristotle: All Animals do naturally come into the world with their head formst; but those that lye cross, or come with their heels formst, are unnatural births. But yet this is not constant in all Animals, but according to their several site or position in the Womb, so is their Birth various; as in Bitches, Sows, and other Multiparous Animals. And the Great-bellied Women know full well, that even the humane Embryo doth sometimes acquire a different scituation; when they find the Child kick sometimes above, sometimes below, and now on this side, and at other times on that.

The Ma-  
 trix.

So also the Matrix being neer delivery, doth bear down, groweth soft, and openeth its Orifice. The Waters also as they commonly call them, are Gathered, that is, a certain part of the Chorion, in which

which the fore-said humour is contained, doth usher in the *Fetus*, and slide down from the *Matrrix* into the *Vagina*, or Sheath of the Womb: and the neighbouring parts also are loosened, and ready to distend: also the *Articubation* of the *Holy bone*, and the *Share-bone* to the *Hanch-bone* (which Copulation, or Articulation is by *Synchondrosis*, or a gristly ligament) is so softened and loosened, that the fore-said bones do easily give way to the parting *Infant*; and by gaping open, do amplify the whole region of the *Hypogastrium*, or *Lower belly*. And when these things are in this condition, it is certain that the *Birth* is at hand. And that so the *Fetus* (like a ripe fruit) may come forth into the World, Nature makes this provision of dilating the parts: as she likewise concocteth the *Milk* which is sent before into the *Breasts*, that the *Infant* now ready to be born, may have his entertainment ready to wellcome him, being now to be sustained from without. And these are the fore-runners of the *Birth*. Wherefore the *Milk* is counted amongst the chiefest signes of an *imminent birth*: I mean such *Milk*, which both for store, plenty, and consistence, is convenient to feed the *Child*: which (according to *Aristotle*) is never so qualified but neer the time of the *Birth*, and therefore is never found before the seventh moneth.

*Fabricius* concludeth upon two queries, chiefly *Gen. an. l.* in order to the *Fetus*: namely, *how the birth is*, 4.c. 8. & *and when?* the last whereof relates to the time of *l. 7. c. 5.* *Bearing*, the first to the manner of the *Birth* it self. pag. 141.

The times of bearing, are by *Aristotle* conceived *De gen. an.* to be various. There are, saith he, *peculiar times*. 4.c. 4. *of bearing* to all kind of *Animals*, for the greatest part & *ult.* as long as they live: for the race of *Animals* which is longer

longer liv'd then others, must of necessity be more durable. But the magnitude of the Animals is by him assigned as the chiefest cause of the variety of the times of bearing. For, saith he, the great fabrick, either of Animals, or any thing else, cannot be easily absolved in a short space: Wherefore Mares, and those Animals that are of kin to them, though they live but a shorter time, yet they are longer in bringing forth: And therefore the Elephant (as they say) is two years in her production, because of its excessive magnitude. But every Animal hath certain bounds of magnitude, which it cannot exceed: and therefore they have a definit matter, out of which they are made: he addeth moreover: But there is exceeding good reason, why Animals do receive the dimension or measure of their times of ingravida-tion, generation, and their lives also by certain Circulations. Now I call a Circulation, a day, a night, a moneth, a year, and all those times which are described by them, as also the motions of the Moon: for these are the common beginnings of Generation to all Animals: For it stands to good reason that the Circulations of less principal things should follow the Circulations of more principal. And therefore Nature hath defined or limited the generation and de cease of Animals, by their motions.

And as the Births of Animals do depend upon the Revolutions or Circuits of the Sun and Moon, so do their times of Coition, and bearing their young vary, and are either more prolix, or breifer.

The time of going with young (saith Aristotle in the same place) is enormous onely in Women. For all other creatures have some one time, but a Woman hath severall, for a Child may be borne either the Seventh, or the Tenth moneth, and likewise in the moneths intervening



intervening between the Seventh and the Tenth: For they that are borne in the Eighth moneth, though they do seldom live, yet they may live. Diverse Animals have indeed a set time of bringing forth, and specially in the Spring, when the Sun returns; diverse in the Summer, and some in the Autumn, as the Gristley Fishes. And hence it happens, that when the time of bringing forth approacheth, they direct themselves to their wonted places, where they may safely build their Stalls, or Nests, where they may bring forth, cherish, and sustaine their young.

Hence it is that those Winds which blow about the beginning of the spring, are called, *Ornithie*, namely from the coming or flocking in of the Birds, which about that time, do by the help of those Winds arrive at certain usual places. And *Fishes* also which swim in Shoals many hundred thousands together, do conspire to meet in such particular parts, and at such set times, to spawn and cherish their fry.

And likewise in the Spring, so soon as ever the Cankerwormes do appear, (whose seeds are for the most part carried about by the Winds like invisible Atomes; and are not begotten as people commonly believe, either of their own accord, or out of putrefaction) the trees do presently shoot forth their buds, which are to become the sustenance of those creatures: and they themselves also are pursued by small Birds, and conducted into their Nests to be devoured by their young.

So that whensoever we see unusual kinds of these Canker-wormes, we do likewise meet with several sorts of forraign litle birds, which are seldom seen at other times, (as if these Birds did pur-

pursue them from remoter nations) and they both lay about the same time. Physicians, upon sight thereof do presently prognosticate now diseases to ensue. The *Bees* do swarm in *May*, when there is plenty of mellifluous *Dew*: the *Wasps* in *Summer*, when the *Fruits* grow ripe: as the *Viviparous* productions fall out, when they have convenient *Milk* in their *Dugges*, or *Udders*. But other *Animals*, which inhabit the same Country still, and do not shift their region, have their customary times of bringing forth, and the supply of their food ready for them at set and appointed seasons. By which means it comes to pass, that the Husbandmen do calculate the seasons for tilling the ground, sowing, and harvest, by the approach of certain *Birds*, and chiefly from the conflux of, and number of *Rooks*. And yet there are some *Animals*, whose times of bringing forth are various and uncertain, as it is usuall with the greater part of domestick *Animals*: For they do celebrate their Coitions at several times, and also bring forth young so too: by reason of the plenty they live in, and disorderly lasciviousness, which is besides the course of *Nature*. But yet such *Animals* (as *Women* also) have more difficult, and more dangerous teemings.

Sympos. l.  
3. qu. 10.

Some kind of creatures, which do more observe the revolutions of the *Moon*, do celebrate both their Coitions, and productions, at any time of the year whatsoever: as *Conies*, *Mice*, and *Women*. For the *Moon* is said (according to *Plutarch*) to conduce much to the expedition of the delivery, when she is in the *Encrease*: because she then by suppling the humours, doth mitigate the paines. Hence I conceive the names of *Locheia*, which signifieth the President of the Birth, as likewise of *Eilytheia* or *Lucina*,  
were

were bestowed upon Diana ; for Diana is the same with the Moon.

Other Animals, (saith Pliny) have a set time of L. 7. c. 5. Bearing, and of Production : but men are begotten at no certainty, all the year long. For though there be a set time designed us by Nature, yet there doth sometimes arise a vast difference ; so that some have been reported to bring forth at the seventh moneth, and others at the fourteenth. And though Aristotle writes that those which were borne in Greece the eighth moneth did generally die : yet *Hist. an. l. 7. c. 4.* he confesseth that in Egypt, and some other Countries (where the Women bear very well) they did *Ibid.* survive. And though he saith, that none can possibly live, who are born before the seventh moneth, (But the seventh month is the beginning of a ripe and mature Birth :) yet most who are then born are infirm and weak, and therefore the people wrap them up in Wool: He nevertheless doth acknowledge, that such may live.

Franciscus Valesius relates that in his time, a *In his Epistle de Incerto tempore partus.* Girl which was borne the Fifth moneth, did live to enter into the twelfth year of her Age. Adrianus Spigelius recordeth the story of a certain Carrier, who did shew it under the publick Notaries hand of the Town of Middle-Burgh, that he was borne in the beginning of the sixth moneth, but so little and weak in his body, that his Mother was forced to roule him up in Cotton, untill he had gained strength, whereby he was enabled to endure the Swath. And *L. 9. de nat. an. cap. ult.* Avicen also reports of One who was borne the sixth moneth, that lived healthy. So also that some who were borne after the eleventh moneth have lived, is approved by the testimonies both of the Ancient and Modern writers. Massurius (saith Pliny) *In the fore-cited place.* writes, that L. Papirius the Pretor, when the second Son



Son sued for the Inheritance, did cast him in Law, though his Mother did affirm that the eldest Son was born in the thirteenth moneth: because there seemeth to be no certain time allotted for bringing forth. There was a Woman not long since amongst us, which kept a Child within her above sixteen moneths, and perceived him to bestir himself in her Womb above ten moneths (as many did evidence) and yet at last she brought him forth alive. But, I confess, those are rare accidents. And therefore *Spigelius* doth reprehend *Ulpian* the Lawyer without cause, in that he admits none to be legitimate Heires that are borne after the tenth moneth. For Lawes, and rules of Art, are for the most proportioned or fitted to the actions of life, which are rightly ordered.

Hist. an. 1.  
7. c. 4.

Besides, it must not be denied, that there are many crafty, fraudulent Women, which for lucre sake, or for fear of punishment or infamy, will feign and swear that they are with Child. And likewise it is well known, that others are easily deceived, and being inexperienced in the matter, do conceive themselves to be with Child, when it is no such thing. And to this purpose are those words of *Aristotle*. The conception of those Infants which are borne after the eleventh moneth seemeth to have not been exactly known to the Women who are with Child, for the women do not know when they first conceived. For their Wombs being possessed with flatulencies, and they afterwards conceiving a Child upon Coition, conceive that flatulency to have been the first beginning of their conception, because they then had some usual indications, as do accompany such as do really conceive. And we have also at other times known, that after three, or four moneths space, the former conception dying in the

the Womb, and putrifying, and the corrupt matter (like to putrid after-purgings) flowing forth, a *Superfatation* hath happened: and yet the same *Women* have constantly affirmed that they have been delivered of a Child after the fourteenth moneth. It falleth out some times, saith Aristotle, *Ibid.* that after one Abortment, teene or twelve succeeding Infants which have been conceived by a *superfatation*, have fallen from the Mother. But if the Mothers have been delivered in some short time after, they have brought forth that Child which was begotten by a *superfatation*: and so they bring them forth, like those children which are born *Twinnies*: As the Fable runs of *Iphicles* and *Hercules*. And this hath been already found to be so. For a certain Adulteress brought forth two Children, one like her own Husband, and the other like the Adulterer. And likewise a certain Woman a long while since, having *Twinnies* within her, did conceive a third Child also, so that when the time of her delivery was fully come, she brought forth the *Twinnies* in their just time, and they were perfect: but the third was but of five moneths time, and so he died instantly.

A certain Servant-Maid being gotten with Child by her Master, to hide her knavery came to London in September, where she Lay in by stealth: and being recovered again, returned home: but in December following, a new birth (for she had a *Superfatation*) did proclaime the crime which she had cunningly concealed before.

It happened to another Woman (as Aristotle proceedeth) that when she had brought forth one Child in the seventh moneth, she was after two moneths end, delivered of two more, whereof the first Child died, but the *Twins* survived. Likewise some Women that have suffered abortment, have conceived two Children at the



the same time, whereof the one hath been aborted before the time, and the other hath continued the full time, and been brought forth perfect.

For it is an easie matter, that the first, or last Conception which is conceived by a *Superfoetation*; being ejected after the third or fourth month, the following moneths may be reckoned more or less then they ought to be, especially by credulous or unskilful Women.

I have sometimes known the Conception to perish in the Womb, and being turned into Putrid Matter, to have glided and issued forth: (like the *fores albi*) and this both in Women and other Animals. There was not long since a Woman in London, which after such a kinde of Abortment, did conceive again; and was delivered at the just time. But a litle after, as she went about her worke, being not in any great paine, or distemper, she did eject by peices the black litle Bones, which related to her former Abortment. Some of these Bones were brought to me, which I could discover to be the fragments of the Spine, the Bone of the Thigh, and of other Bones.

I know a young Woman, who was the Daughter of a Physician, who was of my neer acquaintance, which being Big, felt all the Symptomes incident to Women in that condition; and continuing healthy and sprightly, after the fourteenth week she perceived the motions of a *Fetus* in her Womb; and having finished her time for going with Child, conceiving the hour of her delivery to be nigh at hand, she had her Bed furnished, her Cradle ready, and all the implements appertaining to the purpose laid out for use. But all these preparations came to nothing, and Luci-



na was cross to her wishes ; for her customary paines quite left her, and her Belly as it rose by degrees, so it sunk againe, and shee never sicke for the matter, but she remained barren ever after.

I also knew a noble Matron, who had borne above ten Children, and whose *Courses* were never suppressed unless she were with Child. But being afterwards married to another Husband, besides other usual signes, she apprehended her self to be with Child, by the stirring of it (which both she her self, and her Sister also, who then lay with her in bed, did many times in the night perceive) and all the Arguments I could suggest, could not remove that perswasion from her : till at the last, all her hopes vanished into flatulency and fatness.

So that sometimes, the most approved signes of *Ingravitation*, have not onely deluded the silly Women, but the experienced *Midwives*, and the skilful Physicians themselves. Wherefore, since besides the deceits of Women themselves, there are several false Indications of Gravitation, we must not rashly determine of the Inordinate Birth, before the Seventh Moneth, or after the Eleventh.

The ordinary Computation of going with Child, observeth that time which our blessed Saviour, the perfectest of all men, did fulfil in the *Virgins Wombe* : namely, from the day of the *Annunciation*, which is in *March*, to that blessed day of the *Nativity*, which we celebrate in *December*. And according to this *Rule*, the Sager *Matrons* keeping their account (while they cast in the wonted day in every moneth, whereon they were accustomed to have their *purgations*) they

Ii

are

are seldom out of their *Reckoning* ; but, ten *Revolutions* of the *Moene* beeng expired, they are *delivered*, and reap the fruit of their *Wombe*, upon that very day whereon (were it not for their *Pregnation* ) their *Purgations* would ensue.

De usu  
part. l. 15.  
c. 7.

As concerning the causes of the *exclusion* or *delivery* of the *Fætus*, *Fabricius*, besides that given by *Galen* (wherein he delivers, That the *Fætus* is so long continued in the *Wombe*, till being now enlarged and made perfect, he is capable of being sustained at the mouth : by which argument, the weaker sorts of *Fætus* ought to protract their continuance in the *Wombe*, which yet is no such matter : ) conceives the other reason, and that the more rational one too, to be the necessity that the *Fætus* standeth in of more large refrigeration procured by respiration : because the *Fætus*, so soon as it is borne, doth presently respire, but doth not so soon feed. And this (he affirmeth) is not onely observable in Men and Beasts, but chiefly in Birds : which though they be small, and have yet but a tender bill, yet will the Chickens peck that part of the shell, where they stand in most need of respiration : which thing they doe, being more streightned for Breath, then Aliment : Seeing that immediately as soon they are escaped out of the shell they doe respire, but abstaine from meat two or three dayes together.

But whether Respiration be instituted for Refrigeration, or for any other use, we shall more largely debate elsewhere, out of our *Observations*.

In the mean time I shall propose this *Probleme*, to the Learned ; namely, How the *Embryo* doth subsist after the seventh moneth in his Mothers womb ? when yet in case he were borne, he would instantly breath : nay he could not continue one small hour

hour without it? and yet remaining in the womb, though he pass the *ninth moneth*, he lives, and is safe without the help of *Respiration*. I shall deliver it yet more plainly. How cometh it to pass, that the *Fætus* being now borne, and continuing yet covered over with his entire *membranes*, and abiding still in his *water*, can subsist for some hours space, without any danger of *suffocation*: and yet being shifted out of those *membranes*, if he have but once attracted the *Aire* into his *Lungs*, he cannot afterwards live a minute without it, but dyeth instantly? doubtless this is not for want of *Refrigeration*: for in a difficult Delivery, he sticketh fast in the streights without any *Respiration*, sometimes for some houres together; and yet we find him alive: but yet so soon as he hath escaped, and tasted the *vital air*, if you deprive him of it, you destroy him in a moment. So likewise in the *Cesarean Section* the Infant is taken out of his *Mothers wombe*, many houres after his *Mothers* decease, and yet he is found alive, and continueth safe, without the use of *Aire*, though he lye intombed in the *Secundines*: but having once attracted the *Aire*, (though you instantly restore him to the *Secundines* againe) he will expire for want of *breath*. Whosoever doth carefully consider these things, and look narrowly into the nature of *Aire*, will (I suppose) easily grant, that the *Air* is allowed to *Animals*, neither for *refrigeration*, nor *nutrition* sake. For it is a tryed thing, that the *Fætus* is sooner suffocated after he hath enjoyed the *Aire*, then when he was quite excluded from it: as if the *Heat* within him, were rather inflamed, then quenched by the *Aire*.

But thus much we have discovered by the way



concerning *Respiration*; being perhaps resolved to discuss the debate more fully in its proper place: then which disquisition you shall hardly meet with a more nice; for it is debated with *Arguments* of almost equall weight on both sides.

I return to the Birth, which *Fabricius* conceiveth to come to pass (besides the fore-mentioned necessity of *Respiration*, and want of *Sustenance*) because the *Fætus* being grown bigger, doth press out by his weight; and also can be no longer contained within, by reason of his large bulk; and likewise, saith he, the *Excrements* are so multiplied, that there is no longer place for them in the membranes. But we have already proved, that the humours in the Wombe are not *Excrementitious*. Nor is the reason deduced from the Weight and Magnitude of the *Fætus* more available then the former: for the *Fætus* swimming aloof in the humours, is scarce any burden at all to the *After-birth* or *Womb*; for some *Infants* of nine moneths are very litle, and less then some others of eight moneths onely, yet can they no longer subsist in the Womb. And as to the Weight, *Twins* of eight moneths do preponderate any one single *Fætus* whatsoever, though of nine moneths abode in the Womb, yet are they not born till the ninth moneth. Nor can we quarrel at the scarcity of Aliment: since at that time there is entertainment enough even for *Twins*, and sometimes for more *Infants*; and also the milk which is conducted to the Breasts of Women in *Child-bed*, being recalled to the *Uterus*, would as conveniently supply the *fætus* in the Womb, as out of it.

I shall rather impute the cause of being born, to the juice contained in the *Amnion*, which being

most

most proportionate to the nourishing of the *Fætus*, doth either much faile, or else is depraved by the admixture of the superfluities. As I have also hinted before.

But as for the diversity of *going with Child*, which is contrary to the time allotted by Nature (which diversity doth chiefly respect Women) I do ascribe it to the custome of living, the infirmity of the constitution, and the several passions incident to Women. And therefore those tame Animals, which live amongst us, by reason of their lazy lives, and plenty of food, are of more incertainty in their times of Coition, and production, then wild Beasts, which live according to Natures intent. Likewise sickly Women have easier and greater dispatch in their *Travaile*, then others: but it falls out clean contrary to such Women, whose strength is very much consumed. For the same thing befalls them, as happeneth to *Plants*, whose fruits and seeds, do more slowly and seldom arrive to maturity in cold Countries, then to other *Plants* of the same kind which are in a fat and warm soile.

So *Orenges* in *England* adhere to the trees almost two whole years together, before they come to maturity: and *Figs* also scarce ever arrive at any perfection here, which are ripe in *Italy* twice or thrice a year. And the like befalleth the fruits of the *Womb*; namely, the *Fætus* is brought to maturity sooner or later, by reason of the scarcity or plenty of Aliment, the imbecillity, or strength of the body, and the orderly or inordinate regimen of life (according to the six non-naturall things recited by Physicians.)

*Fabricius* hath described the Manner of the Birth, thus: *The Womb being dilated by the weight*

The man-  
ner of the  
Birth.

of the Foetus; in so much that it can now be no farther distended, and thereupon being excited to disburden it self, is by the motion of the transverse fibres gathered up into it selfe, and so contracted into a narrower compass. And therefore, whereas before, neither the Excrements, by means of their abundance, nor the Foetus by reason of his weight could be contained any longer, the Uterus being more streightned and drawn together then it was, can be much less able to contain them, and therefore first the membranes as being the weaker parts, and more distended, do break, and the humour which is most fluxile, doth first pass out to make the parts glibbe. And hereupon the Foetus followeth, as being not onely increased in his weight (by reason that he now no longer swimmeth in the humour) and so descendeth downwards, forcing the Orifice of the Womb, but as being also compressed, driven forward, and shut out by the action of the Womb it selfe: in which action, the muscles of the Abdomen, together with the Midriffe, are wonderfully assistant.

By which words he describes the ejection of the Excrements of the Guts, and an Abortion rather, then a Natural Birth: for though the membranes in Women do for the most part break, and so disload the Water before the Birth; yet that is not always so: for other Animals do not bring forth as they do, but produce the Entire Conception together, (namely the *fetus* together with the *Secundines*) as we may observe in *Ewes*, *Mares*, *Bitches*, and other Animals; and especially in the *Viper*, which doth conceive within an Egge which is of one onely colour, having a soft shell (such as the humane conception is) and continueth that Conception so long within her, until a *fetus* be formed thereout, which she doth produce wrapped



ped up in a membrane, which membrane (according to *Aristotle*) is broken up the third day. And yet it so happeneth, sometimes, that the young ones are produced, having eaten through the membranes, (while they are yet in the *Uterus*.)

*Hist. an. l.*  
5. c. 34.

And so also it is no novelty to experienced Midwives, that their Women do sometimes bring forth their Conceptions whole, and entire, without any breach in the Membranes at all. And this kind of birth seemeth to me the most *Natural*, wherein the *fetus* (like a mellow fruit which dropeth from the tree, without shaking out its seed before the time assigned by nature) is born with the *Secundines* embracing it. But, where it cometh otherwise to pass, and the After-burden doth adhere to the *Uterus* after the Child is borne: it is oftentimes hardly divided from it, and doth induce evil *Symptomes*, which are accompanied with noisome smells, and sometimes with a *Gangreen*, whereby the Mother is brought into imminent danger.

Because therefore the Birth described by *Fabricius*, is not agreeable to all kinds of Births, but onely to Women, and not to all their Births neither, but to such onely whose Births are premature, and as it were forced: it is to be ranked rather amongst *preternatural*, *precipitate*, and in some sort abortive productions.

In a *Natural* and *Genuine Birth*, therefore, two things are required, which are assistant the one to the other, that is to say, the Woman in travaile, and the *Fetus* which is to be produced. Both which, except they be ripe for the business, the Birth is hardly successful. For if the *Fetus* being disquiet, and coveting to be enlarged, doe prevent his parent by exciting her, and offering

Two things required in a Natural Birth.

### Of the Birth.

violence to her womb : or if the Mother, by reason of the infirmity of her retention, (as if her womb were disturbed with a kind of nauseousness) or by some necessity of expulsion, be before hand with the Infant, the Birth is to be reputed a Disease or Symptome, rather than a Natural and critical Production. As also when some parts of the conception escape out, and others are stil retained within: namely, if the *Fætus* attempt a departure ere the After-burden be dismissed from the sides of the Womb; or else the After-burden, on the contrary, be loose from the *Uterus*, the *fætus* being not rightly composed, nor the *Uterus* relaxed for the accommodation of the work. And therefore the younger, more giddy, and officious Midwives are to be rebuked; which, when they hear the woman in travaile, cry out for paine, and call for help; lest they should seem unskilful at their trade, and less busie then comes to their share, by daubing over their hands with oyles, and distending the parts of the *Uterus*, do mightily bestirre themselves, and provoke the expulsive faculty by medicinal potions: so that being impatient of a competent expectation, by their desire to hasten and promote the Birth, they do rather retard and pervert it, and make it an unnatural and difficult delivery; and leaving the Membranes, or some part of the After-burden still adhering to the Womb, they do both expose the poor women to the injuries of the Aire; and vainly perswading them to their three-legged stoole, weary them out, and bring them in danger of their lives. It is much happier with poor women, and those that dare not own their great bellies, where the Midwives help is never required; for the longer they retain and retard

tard the Birth, the easier, and more successfull proves the delivery.

And therefore there are chiefly two sorts of Unnatural Births; namely when the *fetus* is either *born before*, or *after the time* allotted by nature: (and this is a kinde of Abortive Birth) and the Birth proves difficult and painful, because it doth not succeed in that manner, and order as it ought to do: or else is hindered by some bad *Symptomes*: which cometh to pass chiefly for two reasons: namely, in that the Mother doth faile in her expulsive office, or else that the *Fetus* is himself but sluggish, and so doth not promote his own release: for a facile and natural delivery relieth upon the endavour and joint furtherance of both parties.

*Fabricius* doth ascribe the work of bringing forth to the *Uterus*, to which performance, saith he, the *Muscles of the Lower Belly*, and the *Midriffe* are assistants. But when I consider the matter thoroughly, the throws of the woman in travaile do seem to proceed from the Motion and Agitation of all the Body, (just as we find it in Sternutation.) I knew a young Woman, which by reason of her extream torment in her travailé fell into a Sowne; and became instantly so consternated, stupid, and sleeppy, that nothing could recover her. I being called in to her cure (finding that *Clysters*, and other proper remedies had been applied to no purpose, and that nothing could go down her throat) I put up a feather which was dipped in a strong *Sneezing medicine*, into her *Nose*; by which being moved (though she was so overwhelmed with a deep stupidity, that she could neither *sneeze*, nor be *awaked*) she began to be seized by a kind of *general Convulsion*, all her *body* over, which beginning



ning at the *shoulders*, did by degrees extend it self to the *lower parts*. But as often as I applied this *provocation* to her, her delivery was advanced and came on, and at last, the Mother being insensible of it her self, and remaining still in her sleepy condition, a healthy and sprightly Child was born into the world.

We may observe the manner of their *throws*, in other *Animals*: (as in the *Ewe*, the *Bitch*, and in great *Cattel*) wherein we shall discover that it is not by the sole action of the *Uterus*, or *Belly* either, but is the joint conflict of all the *whole body*. And how much the *Fetus* doth conserre to the acceleration and facilitating of his owne Birth, is chiefly evident in *Oviparous Creatures*: for it is apparent that the *Fetus* it self, and not the *Mother*, doth break through the shell. By which it is probable that in *Viviparous births* also, the chiefest cause of being born is owed to the *Fetus* it self, and that, to his industry and indeavours, and not to his weight, as *Fabricius* conceiveth. For what doth the weight thereof conduce to the birth in *four-footed beasts* which stand upright, or sit down; or in *Women* which lye along? nor doth the endeavour of the *fetus* proceed, as he suppoeth, from its largeness of bulk, or the plenty of the water, (the *Water* indeed is the cause of the delivery of the *fetus* which is dead and putrified in the *womb*, in that by its corruption and acrimony it doth extimulate the *Uterus* to relieve it self) but the *fetus* himself sets open the *Gates* of the *Womb* with his head turned downward, and unlocks their inclosure by his own force, and so struggleth himself into the world by conquest: And therefore that kind of birth is counted the nimbler and more fortunate. But when the *Child* comes into the world thrusting

thrusting his feet foremost, saith Pliny, the birth is counted unnatural, and those that are so born are called Agrippæ, quasi ægre parti, born with much difficulty: For their birth is slow and painful. And yet notwithstanding in abortment, and where the fetus is dead, or that there would be a hard delivery any other way, so that there is necessity of handy-work in the business, the more convenient way of comming forth, is with the feet foremost; for by that means the streights of the Uterus are opened, as it were by a Wedge. Wherefore when the hope of delivery relieth chiefly upon the fetus, (as being strong and lively) we must endeavour to further his comming out with his head fore-most; but in case the task is like to depend upon the Uterus, we must procure his comming out with his feet fore-most.

That the assistance of the fetus is chiefly required in the birth, is evident, not in Birds onely, which do by their own industry without the help of their Parent break up the shell; but also in other Animals; for all Flies, and Butterflies, doe perforate the litle membranes (in which they did lurk when they were the Worme Aurelia) and likewise the Silk-worm doth at his appointed time mollifie and erode the litle Silken bagge, which he had weaved for his defence and security, and so gets out without any forraign aide. And in like manner, Wasps, Beetles, and other Insects; and all Fishes, are borne without others helps; as doth chiefly appear in the Raie, the Fork-fish, the Lamprey, and all cartilagineous Fishes, which do conceive their Egges within themselves, and those perfect ones, and party-coloured, (being furnished with a Yolk and White) and concluded in a strong cartilagineous quadrangular

*gular shell*: out of which being detained within the *Belly* and the *Uterus*, they do form their young; which breaking open the shell by force, do get abroad: as also the young *Vipers*, by their erosion of the *membrane* which containeth the *Egge*, do sometimes in their *Mothers Bowels*, and sometimes as they stick in the very passage, and other times at the end of two or three daies after their *nativity*, expose themselves to the wide *World*. From whence that *Fable*, that the *Vipers* do eat their way through their *Mothers bowels*, and so revenge the death of their *Father*, took its foundation: When yet they do no more then all other *issues* which come into the world, breaking through the membranes which encompass them, either in their very *Birth* it self, or a litle after it.

But how great furtherance the *fatus* doth conferre to its own *Birth*, several observations doe clearly evince. A certain *Woman* here amongst us (I speak it knowingly) was, (being dead over night) left alone in her *Chamber*: but the next morning an *Infant* was there found between her *Leggs*, which had by his own force wrought his release. *Gregorius Nymmanus*, hath collected certaine examples of this nature out of approved *Authors*.

I also knew a *Woman*, who had all the interior part of the neck of her *Womb* excoriated and torne, by a difficult and painful delivery: so that her time of *Lying in* being over, though she proved with *Child* againe afterward, yet not onely the sides of the *Orifice* of the *Neck* of the *Womb* neer the *Nymphæ* did close together, but all the whole *Cavity* thereof, even to the inner *Orifice* of the *Matrix*, whereby there was no entrance even  
for



for a small *probe*, nor yet any egress to her *usual fluxes*. Hereupon the time of her delivery being now arrived, the poor soul was lamentably tortured, and laying aside all expectation of being delivered, she resigned up her keys to her Husband, and setting her affairs in order, she took leave of all her friends. When behold, beyond expectation, by the strong contest of a very lusty Infant, the whole tract was forced open, and she was miraculously delivered; the lusty Child proving the *author of his own*, and *his Parents life*, leaving the passage open for the rest of his Brethren who should be borne in time to come. For, proper applications being administered, his Mother was restored to her former health.

I shall adde one example more memorable then this. The Queen had an exceeding white Mare, excellently shaped, presented unto her: whose *genitall parts* (lest by going to Horse shee might endanger the beauty of her proportions, and become unfit for use) were, as the custome is, locked up all with iron rings. Notwithstanding which, this Mare (by what accident I cannot tell, nor could the Groomes inform me) was made *big with Foale*: and at last, when they feared no such matter, she foaled by night, and the Foale was found alive next morning by the mares side. When I came to heare thereof, I went presently to the Stables, and saw both the *labia* of the *lap*, which were locked up with rings, and all the *privity* towards the left side, so torne and dilacerated from the *right haunch-bone*, that the unity of that most tight part being dissolved, by the incredible force of the young Foale, hee might easily finde a passage through that wide gap. So forcible is the vigour and efficacy of a mature and lively Fætus.

But

But on the contrary, in case the *Fetus* be sickly, and languishing, or borne before its time, it is not properly a *birth*, but an *abortion*: and the *Fetus* is rather *ejected*, then *borne*: and therefore though he be now some dayes old, he will neither take the *breast* kindly, nor deposite his *excrements* as he ought to doe.

And yet the *Uterus* hath its share in this business of *Delivery*: as shall appear in the following example. A poor woman, who was a *Laundress*, did for a long time labour under the *Bearing down*, or precipitation of her *wombe*, and the *sheath* thereof, did hang down to the bigness of ones *fist*, and at length, using no applications to it, her grief grew so forcible upon her, that it now began to resemble a *Scrotum*, the skin being rugged and squalid; and yet found now less pain or trouble in it, then she was formerly used to find, when it newly bore down. But, she asking my advice, I counselled her to keep her *Bed* for some certain dayes, and to mollifie the *dryer parts* thereof with *fomentations*, and *oyntments*, and so when her *wombe* was reduced into her *body*, to keep it still up with *peffaries* and *swathes*, till by the use of drying and strengthening remedies it was confirmed and settled in its *proper place*. The cure did for some time succeed to our wish; but she being poor, was faine to fall to her calling again, to get money; and so intermitting her appointed *applications*, she fell into a *relapse*, and endured it pretty well, her *womb* sometimes retiring back again, and sometimes continuing quite out; but for the most part, at night she did reduce it, and there it remained for some time. But after many dayes, she addressed her self to me again, complaining that her  
wombe

wombe being swelled by the use of her remedies, and especially of her *fomentations* (as she conceived) would now no longer abide in her body. And yet applying some *cyntrments* which I had prescribed, she had forced it in againe, but her cure did not continue long: for no sooner did she rise, and stand upon her leggs, and so goe about her work, but her *wombe* did presently, by reason of its *bulke* and *weight*, disturbe her againe, and would easily beare downe upon any occasion. And now at this time it was as large as a *Bulls Cod*, dangling between her leggs: so that I suspected, that not onely the *sheath*, but that the *womb* it selfe was now inverted, or else that shee was diseased with a *Uterine Hernia*, or *rupture*. It grew at last bigger then a *mans head*, being then a hard tumour, and hanging downe to her *knees* did much pain her, so that she could not goe (but upon all foure) and breaking just in the bottom of it, it did effund a moisture (as if it had been an *Ulcer*) and blood with it. Looking upon it (for I did not explore it by touch) I did suspect it to be a *Cancer* of the *wombe*, and therefore did bethink my selfe of a *Ligature*, and cutting it off: and in the interim, I advised her to apply gentle *fomentations* to it to assuage the paine. But the following night, an *Infant* perfectly shaped, of a span long, was cast out of that *Tumour*, but it was dead; and the next morning they brought it to me; which having *embowelled*, I kept swimming in cold water without corrupting for some moneths time, shewing it to many of my friends (as a miraculous spectacle.) The skin in this *Fetus* was not yet formed; but onely a thin paring appeared (such as lieth about a *Codlin*) which I easily drew away whole and entire;



ture; whereupon all the *muscles* disclosed themselves very distinctly, (for the *Fetus* was leane.) What other matters I observed in the dissection of this *Fetus*, shall be related elsewhere: in this place, I thought it onely convenient to signify, how the *Matrix* it self alone did promote this *Abortive*, and did eject this *Fetus* by its owne industry.

De form.  
fer. pag.  
142.

*Fabricius* doth propose two things worthy admiration (as he saith) in the birth, and after it: the first is concerning the dilatation of the *Uterus* in the Birth: and the other is, of the reduction of the *Uterus* after the Birth into its former compass and narrowness: Wondering that the womb should be so much distended to make way for the *fetus*, and that in a short time after delivery, it should retire into its pristine dimension.

De us. part.  
l. 15. c. 7.  
pag. 143.

How the Neck of the Womb, which is thick, hard, and so shut up, that it will not admit a slender probe, should subscribe to so vast a distention in the time of Delivery, We may with *Galen* admire, saith he, but we shall never comprehend it.

Yet he gives this Reason for it, namely That the *Uterus*, while it is not pregnant, is a thick and hard body, so likewise is its orifice; but being impregnated, it becomes soft and thin: and the nearer it draws to delivery, so much the more is the substance, and by consequence its orifice too, made thinner, and softer. And this he conceiveth to be effected by its distention; which being distended, its compact and complicated body (if he may so speak) is expanded and smoothed, and so, though it was thick and hard before, yet now it is rendred thin and soft, and so consequently fit to afford an exit to the *fœtus*. And afterwards he saith, There was one, who once enquired of me, how, if it be so indeed, it can be true that in wo-

men with childe the orifice of the womb is so occluded, that not so much as a small probe can get into it? I make answer, that it came to be so, in that the womb while it is distended, and is unfolded like a linnen cloth that is compacted and folded up together, doth begin to be raised up first in its upper part, and there to be unfolded, and after it the lower parts do by degrees begin to distend, till at the last that distending faculty doth arrive at the very orifice of the womb it self; which is convenient to be so then, when the Uterus is inclining towards delivery. Wherefore the Orifice of the womb is deservedly shut for the first months, (whilest it is crass and obdurate) but in the last dilated. And thus much touching Galens unknown cause: we might also adde other Reasons, whereby the dilatation of the womb becometh more easie, as, suppose, the Excrements of the Fœtus, namely the Sweat and the Urine: which though they are contained in their own proper membranes and receptacles, yet may the power of Humectation arrive even unto this Orifice, especially since it is placed below, and neer to these humours, being alwaies present with them. Adde also moreover, that a certain mucous and pituitous substance is alwaies found about the orifice of the womb.

But, in my opinion, this worthy man is mistaken; for the Neck of the womb is not hard by complication, but of its own essence, and nervous constitution: and likewise, those accidental Causes (which he alledgeth) are of little advantage to this purpose. For, doubtles, this is done by the Divine Providence of Nature (as well as the rest of the wonderfull Fabrick of the Body) which doth direct her workmanship to a certain End, Action, and Use. The Wombs constitution therefore is such, that in the first Conception it

should have its nervous Orifice constringed, for retention sake, which afterwards in the delivery of the *fetus* (like the fruit in the *Tree*) doth of *hard* become *soft* and *mellow*, for the convenience of *expulsion*: and that not from any *unfolding*, but from the alteration of its *Temper*; for even the connexion of the bones themselves, namely the *Synchondrosis* of the *Haunch-bone* with the *Share*, and *Holy-bone*, & the *synneuresis* or *natural union* or *co-alition* of the *Rump*, or utmost end of the *Os Sacrum* is dissolved and mollified. It is indeed a wonderfull thing, that the *little bud* of a growing *Nut* (as suppose of the *Kernel* of an *Almond*, or other *Fruit*) should break those bones which a *Mallet* can hardly bruise: and that the *tender fibers* of the *Ivy-root* crawling along the narrow chinks or crannies of *stones*, should at last demolish large walls. But it is nothing so wonderfull, that the *genital parts* of *Women* which are relaxed in the birth, should afterward *harden*, and draw themselves together, because it is natural to those parts; especially if we consider that the *Tard* of the *Male* is in coition very much stretched, and hardened, and anon doth *flagge*, and *soften*. We are more to admire (which is beyond all *plication* or *folding*) that the substance of the *Uterus* is not onely daily amplified and distended, according to the growth of the *fetus*, (as if it were, according to the opinion of *Fabricius*, unfolded) but doth grow thicker, more *carnous*, and stronger then before. That indeed is more wonderfull; yet, as *Fabricius* admireth it, that the so large bulk of the *Uterus* should in so few dayes space, by the customary purgations of *Child-bed*, return to its pristine dimensions: since it is not so in other tumours and impostumations: which consisting of

prater-



*præternatural*, and *digestive faculties*, which rebell against the *expulsive*, are longer under cure. And yet this is no more admirable, then the other works of *Nature*; for all things are filled with the *Deity*, and the God of *Nature* displayeth himself in all things,

In the last place, *Fabricius* doth most admire, that those *Vessels* of the *Embryo* (namely the *Oval perforation* out of the *Hollow-vein* into the *Venal Arterie*, and the passage from the *Arterial Vein* into the *Aorta*; (whereof we have treated at large, in our *Traët of the Circulation of the Blood*) should presently after the *birth* wither, and be *obliterated*, and is enforced to betake himself to that reason cited by us before out of *Aristotle*; namely, that all parts are constituted for some *Action* or other, De part. an. l. i. c. 5. and that *Action* being taken away, the parts also themselves do vanish. As the *Eye* seeth, the *Eare* heareth, the *Braine* perceiveth, the *Stomack* concocteth; not because they are endowed with such a kinde of temper and fabrick; but those *organs* are therefore endowed with such a kinde of temper and fabrick, that so they may perform the *Functions* assigned them by *Nature*.

By which argument it appeareth, that the *Uterus* is the chiefest of the *Parts* dedicated to *Generation*; for the *Testicles* are constituted for the *generation* or *seed*; but the *seed* for *coition*; and *coition* it self, or *emission of seed*, that the *Uterus* may receive *fecundity*, and so *generation* ensue thereby.

We have formerly said, that the *Egge* is as it were the *fruit* of *Animals*, and as it were an exposed *Womb*. Now on the contrary, we shall contemplate the *Uterus* as an *Egge* residing within. For as *Trees*, at set times, do flourish with *leaves*, *flowers*, and *fruits*: and *Oviparous Animals*

do sometimes generate eggs, and lay; but sometimes they grow emerit, and the place or part which did contain them is not to be found: so also *Viviparous Animals* have their *Spring*, and *Autumne*. At the Seasons of *fecunditie* and *generation*, the Genital parts, especially in Females, are very much altered: insomuch that the *Ovary* in *Birds*, which at other times is conspicuous, doth then appear something turgid: and the *Belly* of *Fishes*, about the time of *Spawning*, doth much exceed all the rest of their body, by reason of the multitude of their eggs, and affluence of their seed or *spawn*. In many *Viviparous Animals*, the Genitals (namely the *Uterus*, and *Spermatical Vessels*) are perceived to be at some times of a diverse Constitution, Temper, and Fabrick; but as they grow pregnant, or forbear to be so, so do they diversly change; so that a man can hardly know them for the same things. For as in Nature nothing is wanting, so there is no superfluity. And therefore the Genital parts, when there is no more use of them, do wither, are retracted, and as it were obliterated and expunged.

At the times of *Coition*, the *Testicles* are conspicuous in *male Hares*, and *Moles*, and the *Hornes* are then visible in the *Uterus* of their *females*. It were strange to relate, how great an affluence of seed is then conspicuous in the larger sort of *Moles*, and *Mice*, in which at other times no seed at all is to be seen (but their *Testicles* are extenuated and retracted into their *Bellies*) but when they forgoe *impregnation*, there is hardly any such thing as a *Uterus* to be perceivd: insomuch that it is a difficult matter to distinguish *Male* from *Femal*.

The *Womb* doth, chiefly in *Women*, exceedingly vary

vary both in Temper, as also in those Adjuncts which follow the Temper (namely Scituation, Magnitude, Figure, Colour, Thickness, Hardness, & Density.) Unripe *Virgins*, as their *Breasts* are no bigger then the *Breasts* of *Boyes*; so is their *Uterus* very small, white, of a skinny substance, destitute of Veines, and in magnitude, not exceeding the top of ones *Thumb*, or a large *Bean*. So also antient *Women*, as their *breasts* do sink, so have they a retreated, flaggy, lank, pallid *Womb*, void of Veins and Blood. Which I also conceive to be the cause, why *Women* growing Antient have not their monthly *Termes*: but that they descend into the *Hæmorrhoides*, or else do abruptly forsake them, and so endanger their health. But when the *Womb* is now chill, and as it were defunct, & all the Veins and Arteries thereof are expunged, the superfluous blood, when it boileth, doth either restagnate, or divert its course into the neighbouring *Hæmorrhoids*. But on the contrary, in pale *Virgins*, and such as have the *Green sickness* (whose *Womb* is slender, and their *Terms* are at a stay) by Coition with the Male, saith Aristotle, <sup>De gen. an. l. 3. c. 1.</sup> the excrement of the *Terms* is drawn down, for the *Uterus* being tepefied, doth attract the humours, and the passages are opened. Whereupon a vast abatement of their distemper doth ensue: for the *Womb* being unmindefull of his function, many mischiefs do befall the Body in general: because the *Womb* is a principal part, which doth easily draw the whole body into consent with it. No man (who is but never so litle versed in such matters) is ignorant, what grievous *Symptomes*, the Rising, Bearing down, and Perversion, and Convulsion of the *Womb* do excite; what horrid extravagancies of minde, what Phrensies, Melancholy Distempers,



and Outragiousness, the *praternatural Diseases* of the Womb do induce, as if the affected Persons were enchanted: as also how many difficult *Diseases*, the depraved effluxion of the Terms, or the use of *Venus* much intermitted, and long desired do foment. Nor is it less known, how great an Alteration doth befall *Virgins*, when their *Uterus* doth enlarge, and is tepefied; for they grow mature, and their Complexion doth improve; their Breasts strut forth, they become more beautifull, their Eyes glisten, their Voice is more tunable, their Gate, Gesture, and Discourse, are more gracefull then formerly; and their more grievous *Distempers* are at this time, or never, cured.

I knew a noble Lady, which was wilde by reason of a *Uterine Melancholy* and *Distemper*, for above ten years together: and when all Remedies had been in vain employed, she fell at last into the Bearing down of the *Uterus*; which accident, contrary to others judgement, I did prognosticate would conduce to her health; and perswaded her not to return her *womb*, untill its distemper was asswaged by the outward cold aire: the success was answerable to my perswasion, and in a short time she was perfectly cured; and her *womb* being at last restored to its seat, did remaine there, and she lives a healthy life, even to this day.

I knew another Woman, which was troubled with *Hysterical symptoms*, such as no Applications could subdue; who at length after many yeares was cured by the Bearing down of the *Womb*. And both these being relieved in their *Symptoms*, I did restore their *wombs* to their places with happy success. For the *Uterus* being by any sharp humour excited violently to expulsion,

expulsion, doth not onely gently bear down, but (like unto the *Right Gut* when it is irritated by a troublesome *Tenesmus*) doth precipitate it self outward.

Divers therefore is the *Constitution* of the *Uterus*; and that not onely *præternatural*, but *natural* also, namely, in the time of *Fecundity*, and *Barrenness*. In young *Girles*, and *Women past Childing*, it is (as I have said) of the magnitude of a *Bean*, and without any blood: in a *Virgin* ripe for a husband, it resembleth the bulk and form of a *Pear*: in fruitfull *Women*, and such as are apt to conceive, it is as large as a *small Gourd*, or a *Goose-egge*; and doth likewise swell as the *breasts* do, and growing more laxe and fleshy, it becometh warme; and as *Virgil* speaketh of the *Fields*,

—— *superat tener omnibus humor,*  
 —— & *genitalia semina poscunt:*

They all a flowing moisture have,  
 And so a fruitfull seed do crave.

Wherefore their *Terms* being now at hand, or newly over, whilst the warmth and moisture of the Part (which are two necessary causes of *Generation*) do remain, *Women* are most apt to conceive. And so other *Animals* likewise (when they are excited to *Venerie*) their *Genital* parts are moist, turgid, and swelled.

And this *Constitution* I have found in the *Womb*, before the *Birth*. But in *Women* with *Child*, the *Uterus* (as hath been said) doth extend according to the growth of the *Infant*, and so enlargeth into a vast proportion. I have found it presently after *Delivery*, of the bigness of ones head, and

thicker then the middlefingers breadth, and fraught with diverse vessels full of blood. It is indeed a wonderful thing, and (as *Fabricius* noteth) doth much exceed our humane apprehension, that the so vast bulk of the *Uterus* should so much lessen, in so short a space, namely in the space of fifteen, or twenty days.

For no sooner is the *fetus* and the *After-burden* excluded, but the *Uterus* doth by degrees gather it self together, streighteneth its Neck, and re-treateth it self towards the *interiour parts*; being partly insensibly abated by a *diaphoresis*, and partly dissolved into the *Purgations*: and all the bordering parts, the *bones*, *belly*, and all the *Hypogastrical region*, are together contracted, and grow firme againe. In the *Purgations*, first of all *pure blood*, then *corrupt blood*, like that *Water* wherein *flesh* that is newly killed is washed, and then *paler blood* doth issue forth: our women doe call it *lactis proventum*, the coming of the *Milke*, when their *purgations* are now no longer died with blood; because perhaps, the *Milk* doth at that time flow more plenteous, and sound for the Infant, from the breasts; and the *purgations* do then begin to diminish, and dry away: the *alible juice* being now translated from the *Uterus* to the breasts.

And yet other *Animals* do not require so great trouble in the business, for the fore-said parts in them are, in the compass of a day or two, quite restored, and perfectly consolidated. Nay some of them (as the *Hare*, and the *Coney*) in the space of an hour after they have kindled, do admit the *Buck*, and are again fructified by *Coition*. As we have shewed that the *Hen* so soon as ever she hath layed, is compressed by the *Cock*. But *Women* alone,



lone, as they onely have *Termes*, so do they abound with *after-purgings*, and do alone undergoe difficult and hazardous deliveries: because their *Uterus* doth either unseasonably gather it self together, by reason of weakness, or else the *After-purgings* are depraved contrary to nature, or do not come away kindly. For it often befalls *Women* (especially the more tender sort) that the *After-purgings* being corrupted, and grown noisome within, do call in *Feavers*, and other grievous *Symptomes*. For the *Womb* being excoriated by the separation of the *After-burden* (especially if the separation were violent) like a large inward *Ulcer*, is cleansed and mundified by the liberal emanations of the *After-purgings*. And hereupon we conclude of the welfare or danger of a *Woman* in *Child-bed*, according to her excretions. If any part of the *After-burden* be left sticking to the *Uterus*, the *After-purgings* will flow forth evil-scented, green, and as if they proceeded from a dead body: and sometimes the courage and strength of the womb being quite vanquished, a suddaine *Gangrene* doth induce a certain death.

In case any *Clotted Blood*, or any other *preternatural matter*, do remain in the cavity of the womb after the *Delivery*; the *Womb* will neither retire upwards, nor close its *Orifice*, but its *Neck* will continue soft and open: As I have had experience in a *Woman*, which lying very sick of a *Malignant Feaver*, and being very weak, did suffer an *Abortion*: who after the exclusion of the *Fætus*, which was incorrupt and entire, yet lay exceeding weak with a disorderly *Pulse*, and in a cold sweat, as if she were a dying. I perceived the *Orifice* of her *Womb* was lax, soft, and very open, and her *After-purgings* were something noisome: whereupon

on I suspected that something did lurke in her *Womb* which did putrefie : and putting in my hand, I extracted a *false Conception*, as bigge as a *Goose-egge* ; which was made of a most *thick, nervous*, and almost *gristly substance*, having some perforations in it : (whereout did issue a viscid and putrefied matter) and immediately upon this she was discharged of those greivous *Symptomes*, and suddainly after did perfectly recover.

When the *Neck* of the *Womb* doth a litle contract it self, and thereupon the *Clotted Blood* doth get out, though not without pain and difficulty, causing those paines, which our Midwives call the *After-throws* : the danger is then supposed to be over, and indeed it is usually so ; because it is a signe of the strength and firmness of the *Uterus*, collecting it self easily together ; whereby the *After-purgings* are more readily expelled, and the *Woman* is the sooner well.

But I have known the *Orifice* of the *Womb* draw together so close in some immediately after the *delivery*, that the *Blood* being detained in the *Womb*, and thereupon suddenly putrefying and thickening into *Clots*, did induce most greivous *Symptomes* ; and when no means would avails to unburden them, a present death ensued.

A very Honourable Lady in *Child-bed* falling into a *feaver* (by reason no *After-purgings* came from her) had her *Privities* swoln, and scorching : the *Orifice* of her *Matrix* being hard, and shut up, I did open it a litle way by force with an *Iron Instrument*, that so I might immit an *Injection* by a litle *Syringe* ; whereupon black, clotted, and noisome blood did issue out, even to some certain pounds weight, whereby she received present ease.

The

The Wife of a Doctor of Divinity, who was of a good habit of Body enough, but being Barren, did consult me; and being very desirous of Children, she had tried many Medicines, and Physitians, but all to no purpose: she had her *Termes* at the usual times; but sometimes (especially when she had rod on Horse-back) some corrupt and purulent substance did issue from her: Which presently after would stop again. Some conceived it to be the *Whites*: others suspected it to be some deep Ulcer: being perswaded thereunto, chiefly, because her flux was not constant, and by litle and litle, but by certain *Intervalls*, and much at a time: Whereupon by the help of a *Speculum Matricis* they did survey all the sheath of the *Uterus*, and did apply severall Medicines, but all in vain. At last I, being called, did open the inward Orifice of the *Womb*, and presently there did issue forth to the quantity of two spoonfulls, of corrupt matter, sprinkled with bloody streaks. Which when I perceived, I told them that there lay an Ulcer lurking in the cavity of her *Womb*; and by injecting proper Medicaments, I restored her to her former health. But being intent upon the cure, and seeing the ordinary remedies did litle availle, I applied more forcible ones; because I suspected that the Ulcer was inveterate (and perhaps with flesh growing upon it) wherefore to my former injections, I added a litle *Roman Vitriol*; by whose acrimony the *Uterus* being extimulated, did grow so hard, that it did seem as hard to the touch as a Stone: and occasioned severall *Hysterical Symptomes* withall; which Physitians commonly conceive to proceed from the suffocation of the *Matrrix*, and foul vapours being thence sent upwards. This inconvenience continued a while; till the

*Uterus*



*Uterus* being asswaged by milder applications, and such as abate paines, did relax its *Orifice* againe, and did exclude the *sharp liquour* which I had injected, together with a putrid matter. Whereby the *Patient* was in a short time restored.

I conceived it convenient to transferre this *History* out of my *Medicinal Observations*, to this place, that it may evidently appear, of how sharp and quick a sence the *Uterus* is: and how easily it doth close it self upon the presence of its adversary: especially in a greivous and difficult *Lying in*. Now these casualties are most incident to *Women* above all other *Creatures*, and of them, to those that are tenderly brought up, and doe lead a *sedentary* and *lazy life*; as also to such as are of a *sickly constitution*, and do easily fall into distempers.

For *Country Women*, and such as take great paines, are not so dangerously ill, upon so smal grounds. Some of these will be with *Child* again within a moneths time: when as the other are often out of order for two years after.

*Hippocrates* allotteth as many daies for the *Afpurgings*, as for the formation of the *fœtus*; and therefore more for a female, then a male *Child*. But that, witness *Scaliger*, is false: For none of our *Women* are purged above a moneth after their delivery: many not beyond fifteen daies: and some but seven: nay I have known a *Woman*, who was cleansed in three days, even after she had brought forth *Twins*. *Galen* hath many things concerning this subject, in his Book *περί νουμήναν*. The *Women* (as the report goeth) in the *New-found Land*, keep close the day of their delivery; but the next day returne to their ordinary employments.

I will

Com. in  
hist. an.  
Arist. l. 7.  
c. 3.

L. de fœtu.

I will onely adde, for conclusion, a memorable relation, delivered to me from the Noble Lord George Carew, Baron of Tatnes, and for a long time President of Munster in Ireland, who also wrote the Annals of those times. There was a Woman bigge with Child, which followed her Husband, who was a Souldier in the Army; and the Army being daily in motion, was it seemes forced to make a Halt, by reason of a litle River that run cross the place whether they intended to March: whereupon the poor woman finding her labour come upon her, retired to the next thicket, and alone by her self, without any Midwife, or other preparation, brought forth Twins: which she presently carried to the River, and there washed both her self and them; which done, she wrapt her Infants into a course cloath, and tied them to her back, and that very day, marched along with the Army twelve mile together, bare-footed: and was never the worse for the matter.

The next day after, the Deputy of Ireland, the Lord Montioy (who at that time was General of the Army against the Spaniards, at the siedge of King'sale) and the President of Munster, being affected at the strangeness of the story, did both vouchsafe to be God-fathers to the Infants.

---

*Of the Membranes and Humours of the Uterus.*

*Lib. de for.  
fœtus c. I.*

**H**ieronymus Fabricius recounteth four sorts of bodies, which do consist without the Fœtus, namely the Umbilical Vessels, the Membranes, Humours, and fleshy substance. Concerning which, I shall briefly declare, wherein I differ in opinion from him, (by the instigation of several Observations) but first I shall succinctly lay down his opinion.

There are, saith he, three Membranes, two whereof do encompass the Infant throughout, but the third doth not. Of those which do encompass the Fœtus, one is the interior, called *ἡμῖον* id est, amiculum, the little covering. The other is placed next to the former, and called in Greek *Χορίον*, in Latine, Innominata, the coat without a name (but it is by Interpreters falsely called *Secundina*, or *Secundina*, the Secundine) and this also doth encompass the whole Fœtus. The third is called *ἡμῖον* id est, Intestinalis, the Gut-like Membrane, because it is like a stuffed Gut, or Pudding: which therefore doth not encompass the Fœtus, but lieth over part of the breast and lower belly, and is extended to each horn of the Uterus. He doth confess that this Membrane is onely to be found in a Lamb, and a Calfe; and saith that it is joined to the Uterus, and doth by the *Urachus* receive the Urine of the fœtus from the Bladder. And therefore, saith he, In Horned beasts, which have this coat called Allantoides, the Urachus is so large, and strait, that it resembleth a Gut; growing by degrees lesser and lesser, even till it reach to the bottom of the bladder: which doth easily evince

that



Of the Membranes and Humors of the Uterus. 511

that its original is rather from the Allantoides, then from the Bladder. But in a Man, and other Animals which have teeth in both Jaws, the fore-mentioned largeness of the Urachus is so small, that whereas it riseth single from the bottom of the Bladder, it is presently after divided into most slender fibers, which passing along with the Umbilical Vessels, do transfund the Urine into the coat Chorion (in an almost invisible manner.) And upon this ground he doth challenge Arantius of a double error; both in that he denyed any Urachus to be found in a humane fœtus; and likewise for saying, that it doth discharge its Urine through its privy member.

But for my part, I confess my self to be involved in the same errors with Arantius (if at least they be errors.) For I am sure of this, that if you compress the bladder of a large-grown fœtus, (be it the humane fœtus, or of any other Animal) the Urine will start out at the Privities. But as for the Urachus, I never yet saw any such thing, nor could ever observe that upon compression of the bladder, the Urine would gush out into the Secundines. I have indeed in Sheep and Deer, seen a certain Process of the bladder, which doth contain Urine in it; but never saw any such as the Urachus by him described.

And yet I will not too stiffly deny, that there is a Coat called Allantoides; for the Interior membranes are so thin and transparent, (such as wee have signified to be found between the two whites of an Egg) that they may easily impose upon the Eye. Likewise in a Hen-egg, between the Colligamentum and the White (that is, between the Amnion, and the Chorion) there is to be seen some whitish excrements, nay, sometimes the very downright excrements of the Guts; as we have formerly

ly spoken, and *Coiterus* hath also observed. Moreover, the *Membrane* of the *Colliquamentum* it self (wherein the *Chicken* doth swim) though it be pellucid, thin, and so subtle, that (according to *Fabricius* his own confession) thinner cannot be imagined: yet (since according to *Him*, all the membranes though never so thin, are nevertheless double) Nature may possibly sometimes upon necessity deposit the *Urine*, or some other excrement between the *Reduplications* or folds thereof. And such a kinde of *Allantoides* as this, I shall willingly indulge to *Fabricius*: but as for any other kinde of *Pudding*, carried on to both the *hornes* of the *Womb*, I finde no such thing in the *Secundines* of *Cloven-footed-beasts*, nor any thing else, but the *Conception* it self. I onely finde, (as I have said before) a kinde of *Process* of the *bladder*, which being seated between the *Umbilical Arteries*, doth contain an excrementitious humour, and this *Process* is in some longer, and in others shorter.

Wherefore, in my judgment, the *Coat* which *Fabricius* calls *Allantoides*, is the meer *Chorion*: and yet the *Antients* called it *Allantoides*, from the figure of a double-pudding, which it doth resemble. For the exterior membrane, which (like a *Waller* ryed in the middle) is extended to the extremities of each *Horn*; and passing through the interposed part of the *Uterus* (or the connexion of both the *Horns*) is fastened together, is the *Chorion*; which, in *Sheep*, *Goats*, *Hinds*, and *Does*, and other cloven-footed beasts, if you take it in your hand in the middle of that passage, you may draw it away entire: and this we have called their *Egge*, or *Conception*.

For it containeth as an *Egge* doth, a two-fold liquor,

Of the Membranes and Humors of the Uterus. 513

liquor, a *fœtus*, and all things relating thereunto; and hath the same qualifications which *Aristotle* assigneth to an *Egge*; namely, that out of part thereof an *Animal* ought to be constituted, and that the remainder ought to become the support and sustenance of that *Animal*, when it is now constituted.

And therefore that Coat which *Fabricius* calleth *Allantoides*, I either conceive to be the *Chorion*, or that something præter-natural had befallne some *Animal* which he had seen. For certain it is, that it is onely to be found in some few *Animals*, and not alwaies in them neither: for at the Beginning it is not found, & afterwards, in some it is more, and in others less conspicuous, and in some nothing at all is discernable, but meerly a *Process*. And *Fabricius* himself conceiveth it not usefull to the encompassing of the *Infant*, but only to the reception of the *Urine*. And truly I believe, that he maketh mention of it, rather in justification of the Doctrine of the *Antients*, then that himself found any such thing, or thought it usefull to any intent. But (both with the *Antients*, and the whole School of Physitians) he doth confess, that the *Chorion* doth contain *Urine*; where hee saith, that two humours are about the *fœtus*, the one being *Sweat*, which is in the *Amnion*, the other *Urine*, which is contained in the *Chorion*.

By which it is manifest, that the *Antients* understood one & the same membrane under a double compellation; namely, in cloven-footed beasts, (in whom alone it is found) they called it *Allantoides*, by reason of its figure: but in other *Animals*, they called it *Chorion*, from its employment, because they conceived it was designed for the entertainment of the *Urine*. And therefore they

LI

confess



confess that this *Coat* is neither found in a *Man*, nor any other *Animals*. For what need of any other *Coat* to entertain the *Urine*, when that office, by their own confession, is already executed by the *Chorion*? And indeed, there can no probable reason be alledged why that *coat* should be found in *Sheep*, *Goats*, and other *beasts* which cleave the *hoof*, and not also in *Dogs*, *Cats*, *Mice*, and *Others*. For if it were instituted for the reception of the *Urine*, it is necessary, that the *fetus* of *Sheep*, and *Cowes*, should either abound with greater plenty of *Urine* then other *animals* which have *Teeth* in both *Jawes*; or else, that there are three diverse kinds of *humours*; or at least two *Receptacles* of the *Urine*. For this I am sure, that the *Chorion* is from the first beginning full of *water*. But I do not here intend to dispute controversies, I shall rather rehearse what I have found by experience.

It is one thing to exhibit the *fabrick* of a *Conception*, or *Embryo* that is now perfected, as *Fabricius* doth: but another thing, to disclose the the *generation* thereof, and first *scheme* and *rudiments* of all: as it is a diverse business to describe *Apples*, or the ripe *seeds* of *Plants*, and their first *production* from the *bud*. We therefore will briefly relate, how the *Conception* is framed by little and little, even from the *beginning* to the *end*; that it may thence more likely appear, what we are to conclude concerning the *Membranes*, and other *Appurtenances* relating to the *Fetus*.

All Living things do derive their *Original* (as we have said) from something, which doth contain in it both the *matter*, and *efficient virtue* and *power*: which therefore is that thing, both out of which, and by which, whatsoever is born, doth deduce

Of the Membranes and Humors of the Uterus. 515

duce its beginning. And such an *Original* or *Rudiment* in *Animals* (whether they proceed from other *Animals* which do beget them, or else are spontaneous, and the *Issues* of *Putrefaction*) is a certain humour, which is concluded in some certain coat, or shell; namely, a *similar body*, having life actually in it, or in *potentiâ*: and this, in case it be generated within an *Animal*, and do there remain, untill it have produced an *Univocal Animal*, is commonly called a *Conception*: but if it be exposed without, by being born, or else assume its beginning elsewhere, it is called either an *Egg*, or a *Worm*. But I conceive that both ought alike to be called *Primordium*, the first *Rudiment* from which an *Animal* doth spring; as *Plants* assume their nativity from the *Seed*: and all these *Primordia* are of one kinde, namely, *Vital*.

And this kinde of *Rudiment* I finde in the *Vterus* of all *Viviparous Animals*, before any part of the *fetus* appear; namely, there is a *cleare, stiffe, white humour* (like the *white* of an *Esge*) which is included in a *membrane*, which I call their *esge*; and this doth fill up all the *Vterus*, and both the *Horns* thereof, in *Hindes*, *Does*, *Sheep*, and other *Beasts* which cleave the *Hoof*.

In process of *Time*, there is a most pure, and clear *watry part* distinguished or severed from the rest of the *Rudiment*, or *esge*, which we call the *Colliquamentum*, or dissolved part in a *Hen-esge*) and this doth in brightness or perspicuity farre exceed all the rest of the *esge* (in which it is comprehended. The form thereof is round, and it is concluded in its own proper *membrane*, which is most thin and transparent; which they call *Amnion*; as for the rest of the *humor*, which is thicker and darker then this, an *exteriour coat*, which is

contiguous to the *concave superficies* of the *Vterus*, and embraceth the *whole Egge*, doth contain it : which obtaineth a several figure, according to the diversity of the *shape* of the *womb* : for in some it is *oval*, in other *oblong*, but in *Beasts* which cleave the *hoof*, it resembleth a *Waller*.

A litle while after, there doth appear in this crystal *Colliquamentum*, *Punctum rubrum saliens*, A Red leaping Point ; from which most slender strings of litle *Veines* are disseminated, like *rayes* or *beames*. Anon the first *concrement* or *substance* of the *Body* doth appear, like a *Magot*, which is bent like a *Keel* of a *Ship* : and so the rest of the *Parts* doe follow in their order, as hath been related in our *History*. For we have observed that the *Procreation* of the *fatus* in *Viviparous Animals* is instituted in the same manner out of the *Egg* or *Conception*, as the *Chicken* out of the *Henn-Egg*.

But these *Viviparous conceptions* do (as I have noted) differ in *Figure*, *Number*, and *Connexion* to the *Vterus*. For at the beginning, the *Conception* (especially in those that cleave the *hoofe*) doth not grow to the *Vterus* ; but being onely contiguous thereunto, doth fill up all its *cavity*, and distend it, and may be easily drawn out whole.

In such *Creatures* as cleave the *hoofe*, (which do conceive in the *Horns* of the *Womb*) and also in those that are *whole-hoofed*, there is onely one of these *eggs* found at a time, and that also extending it selfe to both the *Hornes*, and though sometimes they do produce a *single*, and sometimes a *double fatus* ; and thereupon have sometimes one *single Colliquamentum*, and sometimes two (namely, one in the *Right*, and another in the



Of the Membranes and Humors of the Uterus. 517

the Left Horn) yet are they still concluded in that Common Egg or Conception.

But in other *Animals*, so many *fetus*, so many several Eggs are to be seen apart; and as many *Colliquamentums* in them, as it is in the *Dog*, the *Cat*, the *Mouse*, and such like *Animals* as have teeth in both their *Jawes*.

The Figure of the *Conception* in such as cleave the *boof*, is like a *Wallet*; namely such, as *Fabricius* doth attribute to the *Allantoides*. In a *Mare*, the internal shape of the *womb* resembleth a little oblong *Sack*; but in a *Woman*, it is *Orbicular*.

In those *Animals*, whose *conception* doth cleave to their *womb* (which, truly, is not so in many, untill the *fetus* be fully formed) it is distinguished by its Diversity of *Connexion*: for in some, it doth stick onely in one place, by the mediation of a *carnous substance*, which we call *Placenta*, the *Uterine cake* in *women*, because it resembleth the round figure of a *Cake*; but in others, it groweth to the *Uterus* in several places, being fastened thereunto by divers *fleshy substances*, or *caruncles*: namely, by five, in *Hindes*, and *Does*; by more in *Cowes*, but they are lesser also: but in the race of *Sheep*, by very many, and those of different magnitude. In *Dogs* and *Cats*, these *Carnous Bodies*, do (like a *girdle*) encompass every *conception* round. A like substance doth in *Hares*, and *Moles*, grow to the sides of their *Uterus*: as also the *Uterine cake* in a *woman*, which embraceth more then one half of the *conception* (as the cups do the *Acoras*, when they first spring) and therefore the gibbous part thereof doth stick fast to the *womb*, but the hollow part doth grow to the *Chorion*.

These things being premised, we shall now disclose, what our judgement is of these *Humours*,

518 *Of the Membranes and Humors of the Uterus.*

*membranes, fleshy substance, and also of the distribution of the Umbilical vessels (which are spoken of by Fabricius.)*

cap. 5.

*Fabricius doth rightly understand by the words* *Stiles* and *Utes*, *the Secundines, or After-Burden,* namely not the *Membranes* onely, but all that which doth come away last in the delivery (or at least, not long after it) and is constituted of *humours, membranes, and fleshy substance*, as also of the *Umbilical Vessels.*

Of the  
Humours.

But as for what he relateth concerning the humours, which as he supposeth he doth receive from the Ancients (as a thing most sure, and which standeth in no need of any proof) namely, that the water in the *Amnion*, wherein the *fetus* swimmes, is its sweat; and that that outward *Water* in the *Chorion* is the *Urine*, are both incongruous, and false assertions: For both those two humours do appear in the conception before any portion of the *fetus* it self be in being: and that which he calleth the *Urine*, is before that (which they conceive to be the sweat.) Nay you may find these humours, especially the last, in some barren, and unfruitful conceptions (wherein there is no tract of a *fetus* at all.)

*De gen. an.*  
*l. 3. c. 9.*  
*Ibid.*

Such Conceptions as these, or *Subventaneous eggs*, *Women* do sometimes eject: and *Aristotle* saith they are called, *Fluxus, Emanations* or *Fluxes*, but we call them *false conceptions*, and *slips*. Such an egge as these, did *Hippocrates* shake from his aborting *Minstrel*. For those creatures which do breed an *Animal* within themselves, have in some sort after their first conception, something like an egge within them, for a humour is contained in a thin membrane, just as if you should pluck the shell off of the egge. But as for that humour contained in the *Chorion*, which  
Fabri-

Of the Membranes and Humors of the Uterus. 519

Fabricius and other Physitians conceive to be the Urine, Aristotle seemeth to apprehend it to be the liquor of the Sperme, or Geniture. For, he saith, *Hist. an. l. 7. c. 7.* The seed being received by the Uterus, having continued in it a while, is covered with a membrane. For if it chance to fall out, before any dearticulation, or delineation of the parts do appear, it looketh like an egge covered with a membrane, when the shell is pilled off. But that membrane is full of Veins, namely, the Chorion, which hath assumed its denomination a venarum choro, five copia, from the conflux or multitude of veins.

I have often seen those kind of egges ejected in the second, or third moneth: they are many times corrupt and rotten within, and do steale out insensibly (like the Whites) and so delude those, who have entertained hopes of a true conception.

Again, those fore-mentioned humours cannot be conceived to be sweat, or Urine: because they abound in such plenty at the very beginning, that the Embryo swimming in the middest thereof, is thereby secured (whilest his Mother runneth, or danceth, or doth imply her body by any forcible agitation) from the collision of the circumjacent parts, as it were by a fortrefs.

Add to all this, that many Animals never sweat at all: (when yet according to Aristotle, all Water, Land, and Volatile Animals, and I shall put in creeping things, and Insects also, whether they be produced in the shape of an egge, or an Animal, or else be spontaneous productions, are all procreated after a like manner) all fowl, creeping things, and fishes, are conceived neither to Sweat, nor Urine. *Ibid.* The Dog, and Cat, do never sweat; nor any other Animal, while it doth emit abundance of Urine.



520 *Of the Membranes and Humors of the Uterus.*

And certainly it is impossible, that any *Animal* should make *water*, before the *Reines* and *Bladder* are made.

Besides, which is a more evincing Argument then the rest, these *humours* cannot be *excrementitious*, because so many litle filaments of *Veins* are disseminated into them: which doe derive *Aliment* from thence (as from a large stock) and afterwards conduct it unto the *fetus*.

Again, if the humour contained in the *Chorion*, be the *Urine*; what need is there of the *Allantoides*? and if the humour contained in the *Amnion* be the *Sweat*, why did nature, who is so exact in all her contrivances, order the matter so ill, as to condemn the *fetus* to lye wallowing in its own *Excrement*? and why doth the *Parent* presently after delivery (for that is usual with several creatures) devour that which is but the *Excrement* of her *fetus*, together with the *membranes* which contain it, with so much greediness and appetite? Some have observed, that if the *Animal* do not eat up these *membranes* and *humours*, it will not give down its *Milk* freely.

If, notwithstanding all these arguments, some men will still maintain that these *humours* (which we dispose to the nutriment of the *fetus*) are *excrementitious*; and that upon this inducement, *viz.* because they also improve according to the growth of the *fetus*: and that in the birth of some *Animals* (at which time the whole stock of *Aliment* is in probability almost consumed) great store of these *humours* doth abound; and that therefore they must needs performe other offices, then can well consist with the dignity of the nutriment. Yet for all this, I confidently pronounce, that these *humours* are the *Aliment* of the *fetus* from

Of the Membranes, and Humors of the Uterus. 521

from the beginning of all; (as the *Colliquamentum* and the *White* do serve the *Chicken* for the same purpose) but in process of time, the thinner, and purer parts being exhausted, the reliques do then put on the nature of an *useful excrement*: and are reserved in some *Animals*, that so they may secure the *fetus* and facilitate the *delivery*. For as *Wine*, when the *Spirits* are exhaled, turns into *dead-wine*: and as several *Excrements* do result from the *reliques* of the *Aliment*: so in like manner, when all that *substance*, which is commodious to the *sustenance* of the *fetus*, is derived out of the humour concluded in the *Chorion*; the remainder doth turn into a kind of *excrement*, and is reserved for the *uses* aforesaid. But all that humour which was included in the *Amnion*, it commonly spent neer the approaching delivery; so that it is probable, that the *fetus* desireth to get out by reason his provisions faile him.

Lastly, if at any time there be any other humour contained in the *Allantoides* (as indeed there sometimes is) I esteem it to be a *preternatural humour*. For I have seen when women at their *delivery* have had a mighty flux of water; and sometimes a two-fold water: our Midwives call them the *By-maters*. And therefore some women have a monstrous *great belly*, though they are brought to bed of a very litle & lean *Childe*; but such women do effund abundance of *Waters*. Some are of opinion, that the larger quantity of *Waters*, doth accompany weakly, and those *female Children*: but the lesser, strong, and *male Children*, I have often seen waters burst forth in the midst of the going with Child without *Abortion*, the Child remaining safe, and strong even to the birth. As therefore there are naturally  
but

522 *Of the Membranes and Humors of the Uterus.*

but two *Waters* only, (whereof the one is contained in the *Chorion*, and the other in the *Amnion*) so it may sometimes fall out, beside the ordinary course of nature, that several *Waters* may be accumulated in *membranes* proper to themselves, or else in the reduplications of the *Chorion*.

Of the  
Mem-  
branes.

As for the *Membranes* or *Coats* of the *Womb*; since their proper use and office chiefly is, to contain the *Waters*; and those *Waters* appear to be two only; it is most certain that the *membranes* themselves are not (necessary and usually) more than two.

But as for those who reckon three, I conceive they were deluded, because the Ancients call the self-same *membrane* sometimes *Chorion*, from the conflux of *Veines*; and sometimes *Allantoides*, from its figure.

Every conception is covered over with these two *membranes*; as also every *Braine* hath a double *Meninx*: every *Tree* and *Shrub* a two-fold *Bark*; every *Seed* and *Fruit* a two-fold *Covering*: whereof the *Exteriour* is the harder, and tighter.

The more *Interiour* of the two fore-mentioned *membranes* (containing the *Colliquamentum*, or purer *humour*) is the thinnest, and is called *Amnion*, that is, *Amiculum*, the little covering, because it covereth and involveth the *fetus*. The *Exteriour* (which is by much the larger, and stronger *membrane*) is called *Chorion*, because (saith *Fabricius*) many *Veins*, and *Arteries* are assembled in it, tanquam in *Choro*, as in a *Quire*. And hence the *Coat* of the *Eye*, and likewise that con-texture of *Veins* and *Arteries* which is found in the *Ventricles* of the *Brain*, are both called *χοροειδεις*, from the resemblance they have with these *veines* in the *Chorion*.

This



Of the Membranes and Humors of the Uterus. 523

This Membrane Chorion doth fill all the Womb; containing a stiffe, troubled humour; and to its exteriour part, the Vterine Cake or Caruncles adhering, do fasten the Conception to the Womb.

The Interior part of this Membrane (in a Woman) is almost conjoined to the Amnion, nor is it easily separated from it. In those Animals which cleave the hoofe it is exceeding large, and containeth a hundred-fold more moisture in it, then the Amnion. For the Amnion at the beginning, is scarce so large as a Nutmeg, or fair Bean, and is commonly found in one Horn of the womb onely, namely in that where the Fetus inhabiteth.

The Coat Chorion is (chiefly in Women) rough, and viscous without; but within smooth, and glibbe, and interwoven with abundance of Veins. The upper part of it is (in Women) thicker, and softer, but the lower part, thinner and more membranous.

In women the After-burden groweth to the upper part of this membrane: But in Sheep, several Caruncles are fastened to several parts of it. In Hinds, and Does, the conception doth cling to the Vterus at five places onely: but in a Mare it doth adhere to the Vterus in an infinite company of places. And therefore Fabricius saith, that the cap. 3. After-birth is in almost all Viviparous creatures, a soft flesh, lax, porous, thick, and something black, growing about the terminations of the Vmbilical vessels, which he resemblance to a looser Parenchyma or assuion of a Liver or Spleen; which is therefore by Galen called *Caro adenosa*, a glandulous 5. apho. 45. flesh; and we now commonly call it *Hepar Vterinum*, the Uterine Liver; into which the extremities of the Vmbilical vessels are disseminated, which

which do derive nutriment from the womb to the *fetus*.

But now, this *fleshy Substance* neither is in all Animals, nor at all times in those in whom it is: but in those Animals onely in whom the *conception* doth firmly cleave to the womb, and then onely, when it is fastened to the womb to bring down sustenance to the *fetus*. For in the *beginning*, the *conception* (like an *egge* seated in the womb) is contiguous to all the circum-jacent parts of the *Uterus*, but doth on no side grow thereunto; but doth produce its *fetus* (as it is in an *egge* which is sat upon by the *Henne*) out of the *Humours* contained in it: but that *adhesion* and cleaving to the womb, is then first of all procured, and also this *fleshy body* is then first beginning to be generated (which *fleshy substance* is the *Tye* of the *Conception* to the womb) when the *fetus* is now perfectly formed, and standing in need of other, and more plentiful supply of Aliment, doth dispatch the *Extremities* of the *Umbilical vessels* to the *Uterus*, as *Emissaries* or *Agents*, that may from thence (as the *Roots* to *Plants*) convey provisions. For in the *beginning*, (as we have shewed) when the *Punctum saliens*, and the *Blood* do onely appear, the *Propagations* of the *Umbilical vessels* are onely disseminated through the *Colliquamentum*, and the *Coat Amnion*. But when once the *fabrick* of the *Body* is set up, those *Propagations* do conduct themselves farther, and being grown more numerous, are *divaricated* in the *Chorion* also, that so they may transport sustenance from thence to the *fetus*, out of the *whitish humour* which resideth there.

By which it appeareth, that the *fetus* of *Viviparous Animals* is at the *beginning* fed in the same manner,

Of the Membranes and Humors of the Uterus. 2

manner, as the Chicken is sustained in the *egge*; and doth for that cause abide in the *Vterus*, that at length (when it hath no longer a supply from its own stock) it may, by the mediation of the *caruncles* grow to the *Vterus*; and be more plentifully supported, by the contribution of its *Parent*.

Wherefore *Fabricius* did rightly observe, that the *conception* was in some Animals scarce fastened to the *Vterus* at all. And therefore *Sowes*, and *Mares*, have none of this *carious* connexion; but their *egge* or *conception*, as it is first of all constituted out of the *moisture* or *juices* which do flow in the *Vterus*, (as the *egge* in the *Hen* is enlarged by the *White*, without any tye to the *Vterus*) so doth it also receive Augmentation; and the *fætus* also, having Aliment administred to him from the *conception*, (wherein he is contained) is in the same manner supported, as the *egge* out of the *liquors*. Whence a notable argument doth result, that the *Fætus* of those *Animals* is no more nourished by the *Mothers blood*, then the *Chicken* in the *egge*: and that the *Humour* comprehended in the *Chorion*, is neither *Urine*, nor any other *Excrement*, but the Aliment of the *Fætus*. Although (as we have observed before) when the *alible juice* is exhausted, the *remainder* thereof doth degenerate into an *Excrement*, like to the *Urine*. And this also is evident, from that which we have formerly noted, concerning the *Cotyledones*; namely, that the *fleshy substance* is in those *Animals* of a *spongy substance*, and doth (like a *Honycomb*) consist of innumerable *acetabula*, *holes* or *orifices*, which are all of them full of a *mucons white matter*; (which *Galen* also records to be anciently observed) and that thence the *Extremities* of the



526 *Of the Membranes and Humors of the Uterus.*

the *Vmbilical vessels* do suck Nutrimēt, which they transport to the *fetus*; as the small *branches* of the *Mesenterical veines* do, in those Animals which are already born, derive *chyle* out of the coats of the *Guts*, through which they are diffused.

I therefore apprehend the imployment of the *Vterine cake* and the *caruncles*, to be such as is commonly imputed to the *Liver* and the *Breasts*. For the *Liver* doth adde a preparation to the *chyle* which is attracted from the *Guts*, sitting the same for the sustenance of the *Body*; and likewise the *Vterine cake* doth afresh concoct the alible nutriment which proceedeth from the *Parent*, to support the *fetus*. The *Breasts* also (being composed of a *glandulous substance*) do strut with *milk*; and though they are parts which (in some *Animals*) do not appear at all, yet at the time of *pregnation* they are seen to be full, and tumorous: to the *Vterine cake*, being a *laxe* or *flabby* and *fungous substance*, doth flow with a whitish sap, and is never found but at the time of *Ingravidation*. The *Liver*, I say, is the nutritive instrument of the *Body* wherein it is; the *Breasts* of the *Infant*, and the *Placenta* of the *Embryo*. And as the mother doth by her own food acquire more *milk* then she hath use for to sustain her *flesh*, and *blood*, which *milk* is reconcocted in her *breasts*, and treasured up; so also such *Females* as are great with young (in whose *womb* this *Placenta* is) do prepare, and suppeditate to their *fetus* an aliment which is defecated by those *caruncles*: by which it cometh to pass, that an impure or laudible diet is administred to the *Embryos*, according as the *Parents diet* it self is either wholesome or impure, and according to the sufficient or imperfect con-

coction,

# Of the Membranes and Humors of the Uterus. 527

*coction*, which they afford it in those organs of the *Uterus*. For some Embryo's have a more perfect organ provided for them, such as is that *carnous substance* of the *Uterus*, which is wanting in some. In some likewise this *Vterine cake* is thicker, larger, and fuller of *Blood*; but in others it is more spongy and paler: like those two *Sweet-breads*, or glandulous bodies called *Thymus*, and *Pancreas*. For you shall finde as much difference of these in Animals, as of the *Breasts*, or of the *Bowels*: for to instance onely in *Livers*, they are in some ruddy and sanguine; in others, (as in the greatest part of *Fishes*, and likewise *Cachectical persons*) pale. *Mares* do feed upon the crude grafs, and do not chew the cud; *Sowes* twill themselves with any filth, and both these want a *Vterine cake*, which is the organ of compleating the Aliment.

And therefore true is that of *Fabricius*; saying, cap. 3. *This fleshy substance is, in several kinds of Animals, different in Magnitude, Figure, Scite, and Number. Women have one onely; as Mice, Conies, Ginny-pigs, Bitches, Cats, and several Animals, whose feet are distinguished into toes, and have teeth in both jaws: but all Animals which cleave the hoof, and have teeth in one jaw onely, whether they be domesticks, as the Sheep, the Cow, and the Goat; or wilde, as the Hinde, the Doe, the Roe, and the like, have diverse. Again, those Animals which have but one, in them it either resembleth a Cake (and thence cometh its denomination) as in Women, Conies, the Hare, and the Mole, Mice, and Ginney-pigs: or else it resembleth a zone or girdle, or swath ingirting the trunck of the body, as in Bitches, Cats, Ferrets, and the like. In some it is like a chalice, or Acorn cup, comprehending the greater part of the fetus (as in the Hare and the Cony :) where the convexe*  
part

part groweth to the *Uterus*, and the concave respects the *fetus*. Likewise in those females which have but one, and that resembling a *Cake*, though the figure be alike in them all, yet the situation is unlike. For in a woman it groweth to the bottom of the womb, and is distant a great way, that is by the length of long vessels from the *fœtus*: but in Mice, Ginny-pigs, and Conies, it is annexed partly to the Region of the Loynes, partly to the sides of the breast. But those animals which have more of these carnous substances then one, they are all of them furnished with teeth in one jaw onely, as Sheep, Cowes, Hinds, Roe-deer, and the like, and yet in these also there is a diversity. For Ewes have more caruncles, and those of different magnitude; the biggest whereof are as large as a Nutmeg; the least, as a Cich-pease, or Vetch: which are also of a round figure, and ruddy complexion, and their convex parts do respect the *Uterus*, appearing like soft Warts, or Nipples. But Cowes have greater, flatter, and paler, which are of a spongy consistence, like Mush-rooms: and these seem to take their original from the *Chorion*. Hinds and Does have five onely; and those bred out of the womb, do protuberate towards the conception, and there exhibit their Cavities. But being firmly fastened to the *Uterus*, are not easily separated from it; except it be when the birth is drawing nigh; at which time (like ripe fruits) they do very easily forego their former connexion. And being torn off from the womb, I have observed the greater part of the Blood which flowes afterward, to issue, not from the Conception, but from the *Uterus* it self.

Fabricius treating of the Union of this Carnous substance with the *Uterus*, doth labour by many (but weak) arguments to prove, that the *Umbilical vessels*,



vessels, do join to the extremities of the vessels *De form.*  
of the Womb by several insertions : and *ser.*  
this he doth undertake, chiefly, to countenance *pag. 122.*  
the old opinion received almost by all : for he  
confesseth that he can deliver nothing certaine  
touching this matter, because the Carnous substance  
hinders a man from discovering the truth thereof. But  
yet neither sense, nor reason do evince, that there  
are any more *Anastomoses* in the *Vterus*, then in  
the *Liver*, between the branches of the *Gate*, and  
*Hollow-vein* ; or in the *Breasts*, between the veins  
which convey blood, and those that waft the Milk.  
There is indeed, in some places a kind of *contigui-*  
*ty* or *juxtaposition* of those vessels, and sometimes  
an insertion of the one into the Coat of the other ;  
but no where any such coalition, or *Vnion*, as *Fa-*  
*bricius* conceiteth. For were it so, the veins  
ought to be inserted into the Arteries : for the  
vessels, which do convey blood into the *Vterus* and  
*Caruncles* are Arteries : but they which transport  
it from the *Vterus* to the *Fetus*, are Veins, as is ap-  
parent to all men ; because they waft the blood  
from the *After-birth* into the *Hollow-vein*.

Wherefore the Opinion of *Arantius* seems to me  
to be more true; namely that the Orifices of the *Um-*  
*bilical vessels* are not united to the Orifices of the  
Vessels of the womb. For there are fewer Ves-  
sels conducting blood to the womb, then veins re-  
turning it to the *fetus* : and the greatest part of  
the propagations of these are terminated in the  
*Chorion*. And yet *Fabricius*, either overswayed  
by his respects to *Antiquity*, or his envy to *Aran-*  
*tius*, doth stubbornly persist in the patronage of the  
old opinion.

As concerning the *Cotyledones*, or *Acetabula*, cap. 4.

Mm

Fa- De Aceta-  
bulis.

*Fabricius* concludeth nothing certain : but only compileth the several opinions of *Antiquity*. But we have before, in the History of *Hinds* and *Does*, shewed in what Animals these *Acetabula* are ; where we have withal signified, that they are certain litle Cells of small capacity, dispersed through the *Caruncles* or fleshy substance, and fraught with a white, or gellyish substance : as the *Honey-comb* is full of *Honey*.

In *Hinds*, they do fitly resemble the shape of that cavity in the *Haunch-bone* which receiveth the *Bone* of the *Thigh* ; and therefore they are by the *Greeks* called *Cotyledones* : and in *Latine*, *Acetabula*, because they resemble those litle Vessels or Sawfers, which were anciently brought to the table with *Vineger* for sawce. These cavities do not exceed in magnitude the perforations of a large sponge, and into each of them, so many slender sprigs of the *Umbilical Vessels* do deeply insinuate themselves ; because in them is laid up the *sustenance* of the *fœtus*, and not *blood* (as *Fabricius* conceived) but a gelly resembling the thicker white of an egge. Whereby it appears (as we have formerly declared) that the *fœtus* of such as cleave the hoof (as likewise all other) are not sustained by the mothers blood.

*Hist. an.*  
l. 7. c. 8.

That which *Aristotle* delivereth concerning the *Acetabula*, that they are diminished as the *Fœtus* doth improve : is contrary to experience ; for the larger the *fœtus*, the larger the *caruncles* also, and their *Acetabula*, or cavities, are more capacious, and more numerous, and more full of an *albugineous* juice.

If you compress these *caruncles*, no blood at all doth issue out ; but as water, or honey doth di-

distill out of a squeezed Sponge, or Honey-comb. So in like manner if you press the *Acetabula*, an albugineous liquor doth drop out; and when that liquor is pressed out, the *Acetabula* are more contract, pale, and flaggy: and at last do resemble the Nipples of the Breasts, or large falling Warts.

*Aristotle* indeed doth truly affirm, that these *Acetabula* are not in all Animals; for they are not in Women, nor in any else (as far as I know) who have onely one carnous substance in their *Vterus*. But as for their office and use: I conceive that all the Caruncles (like Breasts) do not contain blood, but digest a sap, like to the White of an Egge, which they do administer to nourish the *fœtus*.

The description of the *Vmbilical Vessels*, is elegantly delivered by *Fabricius*, as his Tables or Pictures of them are very artificial. Of the Navel. cap. 2.

The Veins, saith he, passing from the Uterus towards the *Fœtus*, are ever united, and improved: nor doth their conjunction give over, until two large Trunks do result out of them all; which penetrating the Navel of the Infant, they do constitute one onely large Trunk; which is inserted into the Liver of the Infant, and perforated into the Hollow and Gate-vein. In like manner, the Arteries adjoined to these Veins, which are very numerous, and small, passing on from the Womb to the *Fœtus*, and at last uniting their forces together, and so enlarging, do conspire into two large Trunks also; which after they have passed the Navel, do separate themselves and break company from the Veins, and sticking to the sides of the Bladder of Urine, by the help of an intervening Membrane; they do here and there disperse them-

M m 2 selves



selves into the branches of the great Artery descending into the Thighs. But we must take notice that this description given by *Fabricius*, doth agree only to the Navel of an Infant, and is not common to the *fetus* of every *Animal* at large: Nor yet to an Infant neither, but after it is fully formed; for the Arteries (at the beginning,) are inconspicuous; as being so slender, that we have need of the quick sight of a *Lyneus* to discern them: nor do they indeed reveal themselves afterwards, but only by their pulsation: for in other things they are no way distinguishable from Veins. Because therefore (as I have shewed elsewhere) the slender branches or filaments of the Arteries have no pulsation, (at least so far as we can discover) they cannot be known from Veins: for they are at that time so thin & subtle, that they are woven to the coats of the veins like the finest threads: or rather do obscurely insinuate themselves into the tunics of the veins: whereby they are utterly indiscernable. But all the veins (by a retrograde production) uniting their sprigs at last, do all conspire into one Trunk; (as all the branches into one stock) as also the Mesenterick Veins are all concluded in the *Vena Porta*.

Neer the Embryo, they are divided into two Trunks; but when once they enter into him, they do constitute one onely Navel, which doth terminate in the Hollow-vein, neer the right deaf-ear of the Heart; & passing through the Liver, is inserted into the Gate-vein, and doth scatter no more Propagations, untill by a very large Orifice it displayeth it self out of the gibbous part of the liver. So that if you open the Trunk of the Hollow-vein from the deaf-ear of the Heart, downwards, and so exhaust it of all its blood, you may perceive three Orifices as

con-

conjoined together; one whereof is the entrance into the descending Trunk of the *Hollow vein*, the other is the going out of the *Branch* of the *Liver* disseminated through all its *gibbous part*; but the third is the *Original* of this *Umbilical vein*. Whereby it clearly appeareth, that the *original* of the *veins* is not to be sought for in the *Liver*: because the *Orifice* of the descending *Trunk* of the *Hollow-vein* is much larger then the *Liver-branch*; for the *Umbilical branch* is as large as that. But the *Branches* are never said to be the *Original* of their *Trunk*; but rather where the *Trunk* is largest, there are we to repute the *Original* of the *branches* to reside: now that happeneth at the entrance of the right *ventricle* of the *Heart*; and therefore that *ventricle* is to be accounted the *original*, & *prominary* of all the *veins*.

I return now to the *Umbilical vessels*, which are not divided after the same maner in all *Animals*; for there are found in some 2. or more litle *Branches* in the body of the *fetus*; whereof some pass into the *Liver*, others into the *Vena Porta*, or *Mesenterical veins*. But in a *human fetus*, the *Trunks* of the *veins* & *arteries* being involved together, are complicated, some 3. or 4. *Fingers* breadth from the *Navel* (as if one should twist so many wax candles together like a *cord*) being skinned over, and conglutinated by the help of a thick & gellyish ~~mem-~~ *membrane*. This litle *cord* passing on to the *Chorion*, is in the flat part of the *After-birth*, and *interior superficies* of the *Chorion* distributed into several *Propagations*; and thence is ramified into many other almost infinite litle *Branches*; by which the *Aliment* attracted as it were by so many roots, is derived to the *fetus*. The *Veines* relating to this litle *Cord*, are distinguished in sundry places by

*little knobbs*, or *warts*, as it were by *little bladders* full of *blood*, that so the *blood* might not rush in too forcibly upon the *fetus*. By the number of these protuberations, the superstitious *Midwives* do spend their divination concerning the number of *children* yet to come; and in case they finde none of these *knobs*, they pronounce the Woman *barren* for the future; and likewise by the distance betweene these protuberations, they fondly prophesie of the space between *childe* and *childe*; and also of the discrimination of the *Sex*, from the variety of their complexion.

Also the constitution of the *Umbilical vessels* is like to this, in almost all other *fetuses* which have but one onely *Uterine cake*; namely, in *Bitches*, *Mice*, and others: but the *little cord* is in them shorter, and less complicated. But in *Cows*, *Ews*, *Hindes*, *Does*, *Sowes*, and other Animals, whose *fetus* is not sustained by *aliment* derived from one *carnous substance*, or *cake*, but from diverse, the distribution of the *Umbilical vessels* is also diverse: For the *little branches*, or terminations of the *vessels* are not disseminated through the *cake* onely, but also (and that chiefly too) without it, through the *coat* called *Chorion*, dispatching their most slender *fibers* thither likewise: just as the distribution of the *Umbilical vessels* (namely without the *little cord*) appeareth in a *humane fetus*, before the *conception* is fastened to the *Uterus*. Whereby it appeareth, that the *Embryo* doth not derive all his *Aliment* from the *cake*; but part thereof, and that the chiefest, from the *humor* contained in the *Chorion*.

As touching the *uses* of the *Umbilical vessels*,  
I do



I do not consent with *Fabricius* : for he is of opinion that all the *blood* is derived to the *fetus* from the *Uterus* by the *veines* ; and the *vital spirits* from the *mother* by the *Arterias*. He also denyeth, that any part of the *fetus* in the *womb* doth execute any *publick function* : but affirmeth, that each particular part taketh care only for it selfe, how it may be nourished, augmented, and preserved. And also, because he findeth no *Nerve* amongst the *Umbilical Vessels*, he concludeth the *fetus* to be void of all *Sense* and *Motion* : Implying, that the *Mother's Womb*, or the *Uterine Cake*, is as it were the *Heart*, and *Original* from whence all things spring to the *fetus*, and from whence the *Influent heat* is divided amongst all the parts. All which are manifest mistakes. For the *Humane Embryo*, when he is not yet four moneths standing in the *Womb* (and some sooner) exerciseth an *opparent motion*, *volutation*, and *calcitratio* : especially if he be prejudiced by extremity of cold or heat, or any other outward inconvenience. Likewise the *Punctum saliens* it self, (before the *Heart* is erected) doth stirre by an *apparent pulsation*, and also distribute blood, and spirits : and being (as we have observed) reduced to a dying and languishing condition by cold, is by the fresh accession of heat, kindled anew, and revived. And also in the *Cesarean birth*, it is very evident, that the *Embryo's* life doth not immediately proceed from the *Parent*, nor the *Spirits* result from her : for we have often seen *Infants*, which have been cut out of their *Mother's Womb*, survive their *Parent* for several hours : and have also known a *Cony* and a *Hare* which did live, though they were born by *incision* made upon the *Uterus* of

their *Parents*. Moreover, it is a sure way to know whether the *Infant* that sticketh in the birth be alive, or not, by the pulsation of the *Vmbilical Arteries*. But most certain it is, that those *Arteries* are not moved by the virtue or operation of the *Mother's*, but of his own proper *Heart*: For they keep a distinct time and pawze, from the *Mother's pulse*: which is easily experimented, if you lay one hand upon the *Mother's* wrist, and the other on the *Infants Navel-string*. Nay in a *Cæsarean Section*, when the *Embryo's* have been yet involved in the membrane called *Ghorion*, I have oftentimes found (even when the *Mother* was extinct, and stiffe almost with cold) the *Vmbilical Arteries* beating, and the *Fetus* himself lusty. Wherefore it is not true, that the *Spirits* do proceed to the *fetus* from the *Mother's Arteries*: nor is that more true; namely, that the *Vmbilical Vessels* of the *fetus* are conjoined by *Anastomosis*, to the *Vessels* of the *Vterus*. For the *Fetus* enjoyeth his own proper life, and is furnished with beating *Arteries*, which are full of *Blood*, and *Spirits* long before the *conception* (in which he is formed, and walloweth) doth cleave to the *Vterus*: just as it is with *Chicken* in the *Egge*.

As for the use of the *Arteries* in the *fetus* (as also in grown bodies) we have in our *Treatise* of the *Circulation* of the blood, demonstrated it to be much different from what hath been formerly received; all which is also confirmed from hence.

The *Secundines*; they also are an undeniable part of the *Conception*, and do depend upon the *Fetus*, assuming life and their vegetal faculty from him. For as in the *Mesentery*, the blood

is derived to the Guts, by the branches of the Cœliacal, and Mesenterical Arteries; and that very Blood being circulated by the Veines, doth convey the *chyle* together with it unto the *Liver*, and the *Heart*: so in like manner, the *Umbilical* Arteries do derive blood to the *Secundines*, which blood the Veins do reduce to the *Fœtus*, together with *alible juice*. And therefore those Arteries do not immediately proceed from the *Heart* as principal Vessels; but (as instruments of inferiour rank and quality) do arise out of the *Crural* branches.

There came forth a Book of late, wrote by *Adrianus Spigelius*, entituled *De formato Fœtu*, of the formed *fœtus*: wherein he treateth concerning the Use of the *Umbilical* Arteries; and doth demonstrate by powerful arguments, that the *Fœtus* doth not receive its Vital Spirits by the Arteries from the *Mother*: and hath fully answered those arguments which are alledged to the contrary. But he might also as well have proved by the same Arguments, that the Blood neither is transported into the *fœtus* from the *Mother's* Veines by the Propagations of the *Umbilical* Veins: which is cheifly made manifest, by the examples drawn from the *Hen-egge*, and the *Cæsarean Birth*.

For did the Heat and Life flow to the blood from the *Mother*; she being extinct, the *Infant* would instantly dye also; (for he must needs be a thing concluded in the same fatality) nay before her: for when death approacheth, the subordinate parts doe first languish, and grow cold, before the principal; and hereupon the *Heart* declines the last of all. The Blood, I say



say, of the *Fetus* himselfe, should grow chill  
first, and disproportionate to its Office, as be-  
ing derived from the *Uterus*; seeing that the *U-*  
*terus* it self, is deprived and destitute of all vital  
heat, before the Heart.

Of

## Of the Conception.

**F***Abricius* hath indeed recounted many miraculous things, concerning the *Birth*, but we meet with more things worthy our wonder concerning the *Conception*. It is indeed a dark, obscure business; however we shall adventure to propose something in a *problematical* way, in such sort that it shall appeare we doe not onely goe about to subvert other mens opinions, but also to disclose our owne. And yet whatsoever falleth from me concerning this subject, I desire may not be so taken, as if I conceived them pronounced by an *Oracle*; but that liberty which I freely allow all other men, I doe of right challenge to my self; that so I may offer those things as true, which seem probable in such dark matters, until such time as they can be convinced of falsity or error.

This imployment doth chiefly relate to the *Uterus*, without whose *preparations* and *functions*, you may in vaine expect a *Conception*. And because it is certaine, that the *Geniture* of the *Male* doth not so much as reach to the *cavity* of the *Uterus*, much less abide there for any time; that *geniture* doth derive *fecundity* to the *Uterus* only by a kinde of *contagion*, (not as if it were now *tangent*, and *operating*, but because it hath formerly *touched*.) The *Woman* or *Female* doth seem after the *spermatical*, *contact* (in *coition*) to be affected in the same manner, and to be rendered *prolific*, by no *sensible corporeal Agent*, as the *Iron* touch-

ouched by the *Loadstone*, is presently indowed with the virtue of the *Loadstone*, and doth draw other iron-bodies unto it. Namely, having once received that virtue, which we have spoken of, it doth exercise the *plastick generative power*, and procreate its own like, no otherwise then *plants* doe, which we see are impowered with the force of both *Sexes*.

But I cannot but wonder, where that *faculty*, (when the act of *coition* is finished, before the production of the *Egge* or *Conception* doth reside? and to what that *active vertue* of the *Male* is imparted? namely, whether to the *Uterus* alone, or to the whole *Female*? or rather, primarily to the *Uterus*, but secondarily to the *Female*? or lastly, whether, as we see with our *eyes*, and think with our *braines*, so a *female* doth conceive with her *Uterus*?

For though the *female* sometimes (conceiving after *coition*) doth not produce a *Fetus*: yet we know that those *Symptomes* did ensue, which gave a cleare testimony of a *conception* set on foot, (though it came to nothing.) Your litle *Bitches* which are kept too plentifully, and thereupon admit *coition* (without success) are notwithstanding observed to be sluggish about the just time whereat they ought to *puppy*, and bark as if they were in *distress*, and likewise filch away the young *whelps* from another *Bitch*, and lick them over and cherish them, (as tenderly as if they were their own natural productions) and fight eagerly to keep them from the true *Parent*. Nay some of them have *milk*; or *beestings* (as they call it) in their *teats*; and are obnoxious to the distempers incident to those that have really *pup-*  
*pie*



pied; just as Hennes will cluck in their season, though they have no eggs at all to sit upon. Some kinde of Birds (as namely Pigeons) if they admit coition at the wonted time, though they lay no eggs at all, or subventaneous ones onely, yet are possessed with their usual sedulity & providence of building nests.

For the vertue proceeding from the Male, doth so largely fructifie the whole Female, that it produceth a thorough change and alteration, as well in the frame of their minds, as in the constitution of their bodies. And though this doe principally happen to the *Vterus* fitted for the impression; and from thence the power and efficacy thereof be derived to the whole body; (as from the turgent testicles of the Male, there is an accession of strength superadded to the whole body) yet the same scruple remaines: namely, how this power communicated to the *Vterus* it selfe, doth inhere in it? as whether in the whole *Vterus*, or in any one part of it onely? For there is nothing to be found abiding therein after coition: for the geniture of the Male doth either suddenly fall out againe, or vanish away, and the blood doth circulate againe from the uterus, by the vessels.

Besides, what preparation or maturity of the *Vterus* is it, that doth require the genitall seed; or from whence doth it proceed? for unless the uterus be prepared for coition, all other attempts are frustrate; nay several animals doe not admit coition it selfe, without they be thus prepared. That maturity, I confess, doth sooner befall them, by reason of their converse with the Male, and the incitements which he useth to provoke them; yet it

it is procured (as that ripeness of *fruits* in *plants*) by natures owne inclination and tendency. But what this *Alteration* is, I shall now deliver, according as I have found it by experience.

First of all the *uterus* appears *thicker* and more *fleshy*: and afterwards (forasmuch as concerneth the *interiour superficies*, which is the place where the future *conception* is to be received) it groweth more *tender*, answering in *lubricity* and *softness* to the internal ventricles of the *Braine*, as we have even now affirmed concerning *Hindes*, and other creatures which *cleave the hoofs*. But in *Bitches*, *Cats*, and other multiparous Animals, whose feet are distinguished into *toes*, the *horns* of the *Wombe* doe exactly resemble the litle smooth trumpets of a womans *womb*, or the *appendixes* of the guts of *Birds*, or the *Ureters* in *Men*: and in some places have litle *knobs* which doe *swell inward*, and become exceeding soft, through which, after *coition* (as we have observed in *Hinds* and *Does*) as if they did open themselves, the first albugineous humours doe transpire into the capacity of the *Uterus*, out of which humours the *Conception* or *Egge* is formed. And this is the manner how the *Uterus* is by the *Coition* of the *Male* (like *Fruit* by the *Summer heat*) *impregnated*, and heightened into the highest pitch of maturity.

But because there are no manifest signs of *Conception* visible, before the *Uterus* doth begin to open, and the albugineous liquor, or slender threads, (like the *Spiders web*) and the first rudiments of the future *Egge* or *Conception* appear: and seeing the substance of the *Uterus*, now ready  
for

for Conception, doth so neerly resemble the Constitution of the Braine : why may we not imagine, that both their functions are also alike; and that something like, if not the selfe same thing that the *phantasme*, or appetite is to the brain, is excited in the *Uterus* : from which the generation or procreation of the *Egge* doth succeed ? for both their functions are equally called *conceptions*, and both are *Immaterial*; though they be the principles of all the actions of the body : namely this, of the Natural, that of the Animal actions: this the first cause and principle of all actions relating to the generation of *Animals*, & that of all actions tending to their preservation. And as *Appetite* doth spring from the conception of the *braine*, and that conception from the outward *appetible* or *desirable objects*: So also from the *Male* (as being the more perfect *Animal*) as from the most natural appetible object, the natural conception doth arise in the *Uterus*, as the Animal conception in the Brain.

And from this Appetite or Conception it cometh to pass, that the female doth produce an offspring like the male Genitor. For as we, from the Conception of the Form, or Idea, in the Braine, do fashion a form like to it in our works; so doth the Idea or Species of the Genitor, residing in the *Uterus*, by the help of the formative faculty, beget a *Fetus* like the Genitor himself; namely by implanting that *Immaterial species* which it hath, upon its Workmanship. In like manner as *Art*, which is the *ẽĩδῶς*, or Species of the future work, doth produce a Like in its operation, and generate it in the *matter* : As the Builder erects a House, according to his pre-received conception. And the same thing happeneth in other productions



ctions, and artificial generations. So that what discipline doth effect in the *Braine*, namely Art; that in proportion doth the Coition of the Male effect in the *Uterus*, namely the *plastical Art*: whereby several *fætuses* are procreated either like or unlike, by the same Coition. For if the Generations, and first artificial conceptions (which are onely imitations of the natural) are thus produced by the *Braine*; how much more probable is it, that the Exemplars of Animal Generation and conception, are in like manner produced by the *Uterus*.

And because Nature (all whose works are admirable and divine) doth institute such an Organ (namely the *Braine*) by whose sensitive faculty and virtue, the conceptions of the rational soule doe exist; namely Desires, and Arts, and the Principles and Causes of so many several productions, whereof man (by the motive faculty of the *Braine*) is the Author by Imitation; why shall we not think, that the same Nature, which hath contrived the Womb, which is a no lesse admirable Organ then the *Braine*, and hath framed it of a like constitution to execute the office of Conception, hath designed it also to a like function, or at least to one which beareth an Analogy with it; and that Nature did intend an Organ which is every way like the *Braine*, to an imployment, like to that to which the *Braine* is assigned? For since a skilful Artificer, doth accomplish his Workmanship, by his ingenious proportioning one Instrument to one thing, and the same to the same, and the like to the like: So that by the materials and shape of his Instruments, a man may easily judge of their use and action

actions; no less then *Aristotle* hath instructed *Analyt. l. 2*  
 us, to know the nature of *Natural Bodies*, by c. 35.  
 their conformation, and the *Fabrick* of their  
*Parts*; and the *Art* of *Physiognomy*, doth by  
 lineaments and parts of the face (as the *Eye*,  
*Nose*, *Fore-head*, &c.) give judgement of the  
*manners* and *dispositions* of *Men*: What shall  
 hinder us, out of the same *fabrick* of *parts*,  
 to pass our conjecture that their Office is al-  
 so the same?

But such is the preposterous success of things,  
 that when we come to debate customary and fa-  
 miliar things, their frequency doth diminish their  
 greatness, and admiration which is due unto  
 them; but when matters of less consequence  
 (but such as are more unusual) do present  
 themselves, wee instantly magnifie them be-  
 cause of their novelty and rarity. Whosoever  
 shall weigh with himself, how the *brain*  
 of the *Artist*, or the *Artist* himself by virtue  
 of his *brain*, doth form things which are not  
 present with him, but such as he only hath  
 formerly seen, so much to the *life*: and how  
 little *birds* which immure themselves all win-  
 ter long, do exactly *chant*, and recall to minde  
 those *Duties*, the next *Spring*, which they had  
 learned the *Summer* before, though they did  
 never practise them all the while; and which  
 is yet more strange, how a little *bird* will  
 most artificially contrive a *Nest* (whereof shee  
 never saw any *platform* before) and that not  
 from her *memory*, or any *habit* implanted  
 in her, but onely by meere *phantie*: and  
 how a young *Spider*, without any *pattern*,  
 or *brain*, by the help of *phantie* onely, doth  
 N n dispose

dispose her *web*; whosoever, I say, doth diligently ponder these things, will, I conceive, not think it an absurd or monstrous matter, for a woman to become the efficient cause of Generation, being impregnated by the conception of a generall, immateriall Idea.

I know full well, that some scoffing persons will laugh at these conjectures; approving nothing but their owne private inventions. Yet this is the wont of Philosophers, when they cannot clearly discover how things themselves are brought about, to conceive some way consonant to the course of nature, and the next borderer upon truth her selfe, how such matters may be atchieved. And, indeed, all those *Opinions* (which we now cry up) were at first meere *figments*, and *imaginations*; untill they wrought a solid credit in us, by sensible experiment, and were ratified by their necessary knowne causes. Aristotle saith, That Philosophers are in some sort lovers of Fables, because a Fable doth consist of strange things. And, indeed, those who were first possessed with the admiration of things, did advance Philosophy. And for my owne particular, since I plainly see that nothing at all doth remaine in the *Uterus* after coition, whereunto I might ascribe the principle of generation; no more then remaines in the braine after sensation, and experience, whereunto the principle of Art may be reduced; but finding the constitution to be alike in both, I have invented this Fable. Let the Learned and ingenious stock of men consider of it; let the supercilious reject it; and for the scoffing

Metaph. l.  
1. c. 2.

ticklish



ticklish generation, let them laugh their swinge.

Because, I say, there is no *Sensible* thing to be found in the *Uterus*, after *coition*; and yet there is a necessity, that something should be there, which may render the *female* fruitful; and that (in probability) can be no corporeal essence; we have no refuge left us, but to fly to mere *Conception*, and reception of *Species* without any matter; namely, to apprehend, that the same thing is effected in the *womb*, as in the *Braine*: unless some cunning *Philosopher*, whom the Gods have better provided for, can finde out some *efficient cause*, which is not concluded in our recapitulation.

Some *Philosophers*, even of our owne time, have furbushed over the old opinion concerning the *Atomes*: and doe therefore conceive, that this *Contagion* (as also all other) doth proceed from the most subtle *effluvia*, or emanations of the masculine seed, which do easily transpire after the manner of *Odours*, and so are shot into the *Uterus* at the time of *coition*. Some againe raise up certaine incorporeal spirits, like so many *Agents*, *Angels*, or *Demons*. Others understand a *Contagion*, like to a kinde of ferment, or sower leavening. Others phansie, and imagine otherwise. Allow therefore, amongst others, some place for this conjecture of mine, untill there be some certainty established in the business.

I have observed many things, which will easily extirpate the recited opinions of other men: (so that now it is much more obvious to say what it is not, then what it is) but those Observations relate not to this place,

but must be proposed elsewhere. At the present I shall say this onely: If that which we commonly call *Contagion*; as being derived from the *spermatical contact* in coition, and remaining behinde in the *female*, (when the *Geniture* it selfe is not then in presence) is the efficient and operatour of the future procreation: if, I say, this *Contagion* (whether it be *Atomes*, or *Odour*, or *Ferment*, or whatsoever else) be free from the nature of a *body*, it must of necessity be an *incorporeal thing*. And if moreover, upon enquiry it do appear, to be neither a *Spirit*, nor a *Demon*, nor a *Soul*, nor any part of a *Soul*, nor yet something which hath a *Soul* (as I conceive I can demonstrate by several arguments, and experiments.) What remains, since I can imagine nothing else, nor no man hath hitherto dreamed of any other thing, but freely to profess my self to be at a stand? But

*Ibid.*

He that doubts & admires, saith *Aristotle*, doth confess he doth not know. Wherefore, if to avoid the stain of *Ignorance*, ingenuous Men turn *Philosophers*, it is cleare, that they pursue *Knowledge*, for *Knowledge* sake, and not for any other use.

Wee ought not therefore to be condemned, if being desirous of knowing things, and upon that account walking in untrodden paths, wee set before you something, which, at first blush, may seem *fabulous*, and *fictional*. For as all things are not to be swallowed with too much credulity; so those things which have been exactly and long considered, are not utterly to be despised, though they doe not appeare so rare to sharp-witted men.

*Metaph. l.  
2. c. 1.*

*Aristotle* himself wrote a Book de *Mirabilibus*

*bus Auditis*, of Heare-say Wonders. And in another place hee saith, That wee must not onely pay thanks to them, to whose Opinions a man may safely subscribe; but to those also who have spoken but superficially to the purpose. For even they also are of some use, for they exercise our habits. For had not Timotheus been, wee had lost a great deale of Musicke: And yet if Phryniſ had not been, Timotheus had not been existent neither. In like manner they who have delivered any kinde of truth; for wee have received some Opinions from some Philosophers, and yet some others were the occasion of these Philosophers.

And therefore being moved by the example and authority of so Gallant a person as Aristotle, least I might seem made up of nothing but the subversion of other mens Doctrines; I have chosen rather to propose a feigned Opinion, then none at all: and have contented my self in this place to play the Phryniſ to Timotheus; viz. to shake off the sloth and drowziness of the Age wee live in, and to awaken the wits of Industrious heads, permitting rather that abler men should sport themselves with my proposalls, then that any carefull Enquirer into the nature of Things should accuse mee of sluggishness.

Truth is, a man cannot search after a more august Theorem, nor learn any thing of more use, then this; namely, How all things are produced by an Univocal Agent? or after what manner the same thing doth still generate the same? and that not onely in the productions of Art; (for so a House creëts a House, one Face limnes another, and one I-



mage formeth another Image) but in those also which relate to the Minde; as a Minde begets a Minde; and one Opinion another Opinion. Democritus his Atomes, and Eudoxus his Chiefest Good placed in Pleasure, did impregnate Epicurus: Empedocles his Foure Elements, Aristotle: the Doctrine of antient Thebes, Pythagoras and Plato: and Geometrie, Euclid. Just in this manner is the Son borne like the Father; and the Virtues which doe innoble a Family, and the Hereditary Vices also, are sometimes after many Generations transported to Posterity: some Diseases also produce their like in other subjects; as the Leprosie, the Gout, Syphilis, or French-Pox, and so forth.

*Arist. hist.*

*an. l. 7. c. 6.*

*Gr. de gen.*

*an. l. 1. c. 17*

*l. 7. c. 11.*

But what talke I of Diseases, since Succession hath at a vast remove, repeated the very Moles, Warts, and Scarres, which the Great-grand-fires formerly wore? The marke of the Familie (saith Plinie) is repeated in the armes of the Daci, every fourth Birth. That Minde, Opinion, and those very Manners, which are now out of use, may many yeares hence (when all those are decayed, which are now received) returne againe. For the Eternall minde of the Divine Creatour, which is imprinted in Things, doth create the Image of it selfe in Humane Conceptions.

Having therefore overcome some difficulties which relate to this Subject, I have a strong desire to discourse the Matter more closely: that what I have hitherto delivered cursorily, may seeme to carry a fairer probability at least with it, and also

also to excite the Wits of Studious men,  
to make a deeper search into the bu-  
sinesse.

Therefore (that we may illustrate the thing the  
better) let *A* stand for the *fruitfull egge* (name-  
ly the matter of the *fruitfull chicken*) which is al-  
terable and convertible into a *chicken*, or is a *chick-*  
*en in posse*: and let *B* stand for that which fructifi-  
eth the *egge*, distinguishing it from a *subventane-*  
*ous egge*: namely, the *efficient cause* of the *chick-*  
*en*, or that which doth alter the *Egge*, and con-  
vert or terminate it into a *chicken*. And *C* for  
the *chicken* it selfe, or *final cause*, for whose sake  
both the *Egge*, and that which fructifieth the  
*Egge* doe exist: namely, the *act*, or *reason* of the  
*chicken*.

Now we take it for granted (which *Aristotle*  
doth demonstrate) that every *first Mover* or *Alter-*  
*rer* is together with that thing which is moved or  
altered by it. Now those things are most pro-  
perly said to be *simul*, together, which are gene-  
rated at the same time: so that *movens & mobile*  
the thing altering, and the thing altered are actu-  
ally together, and in case one of them be, the  
other must needs bee also; for of necessity if  
the effect be in being, the cause thereof must  
also be.

Whensoever therefore *A* (namely the *fruitful*  
*Egge*, is actually in Being; *B* likewise (namely the  
*internal mover*, and *efficient*, or *fructifier*) is actu-  
ally in being also. But whensoever *B* is actually  
existent, *C* also, (at least in some sort) namely the  
*Species* of the *chicken*, or the *form* without matter  
is existent. For *B* is the *internal efficient* of the  
*chicken*; that is to say, that thing which doth

move, or alter) *A*, (namely the *Egge*) into *C*, namely the Reason of the chicken. That therefore every moving thing, may be together with the thing that is moved; and every cause with the thing caused, it is necessary that *C*, should exist together with *B*, because the *Final cause*, as well in *Nature*, as *Art*, is the first of all the causes; for it moveth, and is it selfe not moved: But the efficient moveth, because it is incited by the finall cause. For there is in every efficient, in some sort, *ratio finis*, the reason of the End or finall cause; by which final cause, the efficient, operating with providence, is moved.

de part. an.  
l. 1. c. 1.

Aristotles Authority is clearly on our side. That seemeth, saith he, to be chiefest amongst Natural causes, which we signifie under this notion, *Cujus Gratia*, for whose sake: For that is the reason; but the reason is the first cause as well in Natural, as Artificial effects. For when the Physitian doth define Health, and the Mason a House, by either the Intellect, or by Sense, he useth to render the reasons and causes of the thing which he doth effect, and also subjoineth the reason why hee maketh it so: though that cause which is the cause for whose sake, which is the cause, and reason of the good and faire, is rather conjoined to the works of Nature, then of Art.

Phys. l. 2.  
ca. 3.

But the End, saith he, is the thing for whose sake: as the thing for whose sake we walk, is Health. For if you aske, why a man doth walk, we reply, to continue his Health: and having made that answer, we conceive we have rendered the cause thereof. And therefore whatsoever is interposed, some other thing moving thereunto, is done for the Ends sake: as Extenuation is procured



red for Health sake, or Purgation, or Physick, or any other instruments, for all those are for the Ends sake. And a while after. But we ought alwayes to seek out the first cause of every thing: as in other matters. As a man buildeth because he is a Builder: but he is a Builder by reason of his Art of building: this therefore is the first cause: and so it is in all things whatsoever. And hereupon he affirmeth, that, that cause which doth first move, and in which the Reason and de gen.an. form doth lye, is a worthier, and more divine cause, <sup>l.2.c.1.</sup> than the material.

In every Natural Generation of Animals therefore, both the matter out of which, and the efficient by which (namely A, the thing moved, and B, the thing moving) are both for the sake of the Animal already begotten, or which is to be begotten: because that which moveth, and is not moved it selfe, namely C, is alike in them both. For both they (namely A, & B,) are both movable, and moved; namely the thing fructifying, which is B, (which doth both move and is moved,) and that thing which is fructified, which is A, namely the Matter or Egge, which is onely moved or altered. Wherefore if no moveable thing be actually moved, unlesse the thing moving be together present with it. Certainly, neither shall the Matter be moved, nor the Efficient move or effect any thing, unlesse the first mover bee in some sort present too: viz. the form, or species which is without Matter, and is the principal cause. For the Efficient and Generant (accor- de gen.an. ding to Aristotle) as they are such, do belong <sup>l.2.c.4.</sup> to that which is effected, and generated. And there-

therefore it is a syllogisme framed out of the first and necessary causes: namely,

*Whensoever B is actually existent, C also is actually existent: (namely, moving in some sort)*

*Whensoever A is actually existent, B is also actually existent.*

*Therefore, whensoever A is actually existent, C also is actually existent.*

*Arist. de  
part. an. l.  
1. c. 6.*

Indeed *Natural*, and *Artificial Generation* are after one and the same manner. For both are instituted for the sake of something, and doe alike out of a kinde of providence direct themselves to a proposed *End*: for both are first moved by some conceived form, which is immaterial, and is produced by *Conception*. For the Braine is the Organ of the *Conception* of the one, (for Art is the Reason of the Worke) (devoyd of all Matter) in the Soule, whose Organ the Braine is) but the *Uterus*, or *Egge* of the *Other*.

The *Conception* therefore of the *Egge*, or *Uterus*, is (in some sort) like the *Conception* of the Braine it selfe, and both of

of them doe alike partake of the End. For the Species, or Forme of the Chicken is in the *Uterus*, or *Egge*, without any matter at all: as the reason of the Work is in the Artificer, and the Reason of the House, in the Brain of the Builder.

But because, *to inesse*, this word, to bee in, is perhaps an Equivocal word, and things may bee said to bee *Simul*, together, severall wayes; therefore we say, and affirme, that the Species and Immateriall Forme of the future *Chicken* is *Aliquo modo*, in some sort, the cause of the pregnation, and fecundity of the *Uterus*: because, after coition, there is no corporeal thing found therein.

But how this Immateriall cause, as the principle, can be alike in the Braine, and in the *Uterus*, and how they agree among themselves, or doe differ, namely the Conceptions of the Braine, and of the *Uterus*, or *Art*, and *Nature*; and in what manner, that which fructifieth (namely, the *internal Efficient cause* of the procreation of an *Animal*) is in the Male, and its Geniture; in the Female and her Womb; in the *Egge* also, or mixt Workmanship of both; and what the difference betweene them is: hereafter, when wee shall treat Universally of the Generation of all *Animals* (even of those also, which are generated by *Metamorphosis*; namely, of *Insects*, and *Spontaneous Productions*, in whose *Egges*, or first *Rudiments*, there is a plaine Species or Immateriall forme, as being the moving principle in regard of those things which are to be pro-



produced; as also in all other Seed whatsoever) and also when we shall discourse of the Soule, and its affections; and also how Arts, Memory, and Experience, are onely the Conceptions of the Brain, wee shall endeavour both largely, and perspicuously to explaine.

**FINIS.**



## ERRATA.

Ag. 42. lin. 36. read arising from the Chine. p. 46. l. 30.  
r. doth, but by Juxtaposition. p. 67, l. 11. carried it to. p.  
59. l. 20. every other. p. 70. l. 27. clocking. p. 93. l. 23. its  
growth. p. 105. l. 11. is yet. p. 291. l. 13. cone. p. 292. l. 5. for  
are not, r. would not be. ibid. l. 12. after part, r. made up of those  
humours mixt together; it is a similar animate part. ibid. l. 14.  
del. and. p. 293. l. 16. del. it. p. 294. l. 25. for pour out the  
Scrum, r. pour it out.



А Т А Я Я



